

## Engine Overall

	-w	-q	-v		-
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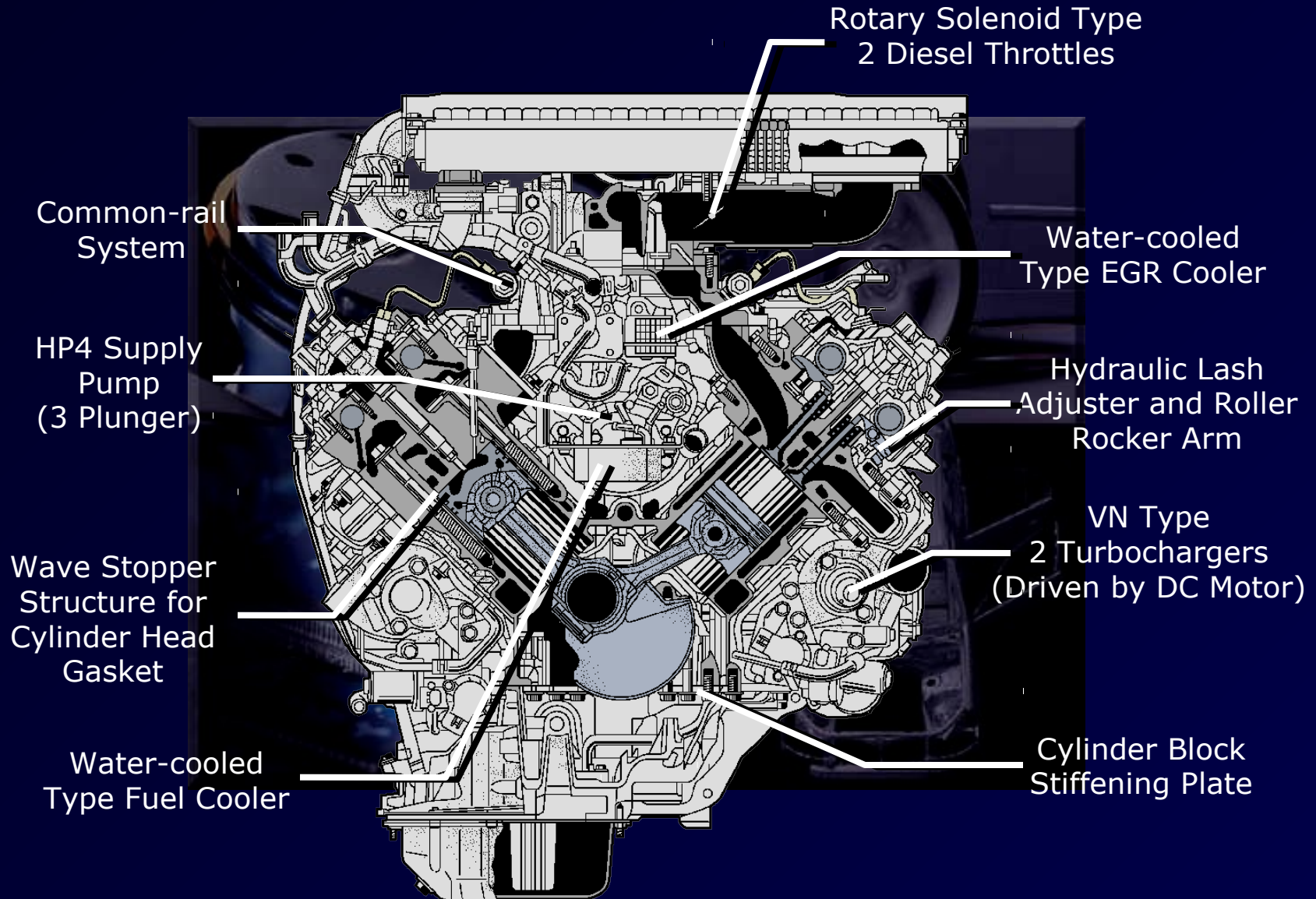
- 1VD-FTV Engine
  - 4.5-liter, V-type 8-cylinder, 32-valve DOHC, TOYOTA D-4D with turbocharged diesel engine



# Engine Overall

-W	-Q	-V		-
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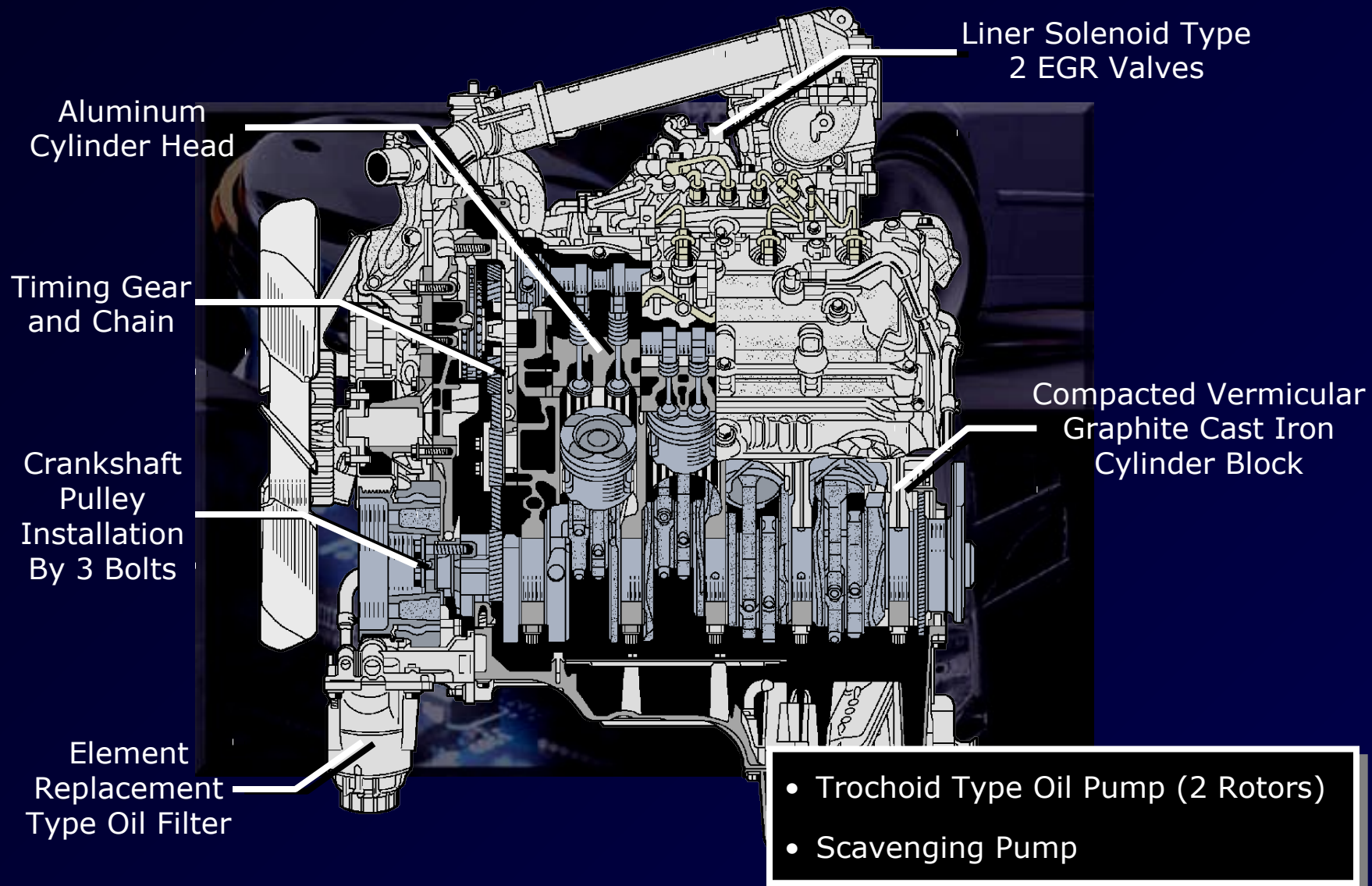
## ● Features



# Engine Overall

-W	-Q	-V		-
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## Features



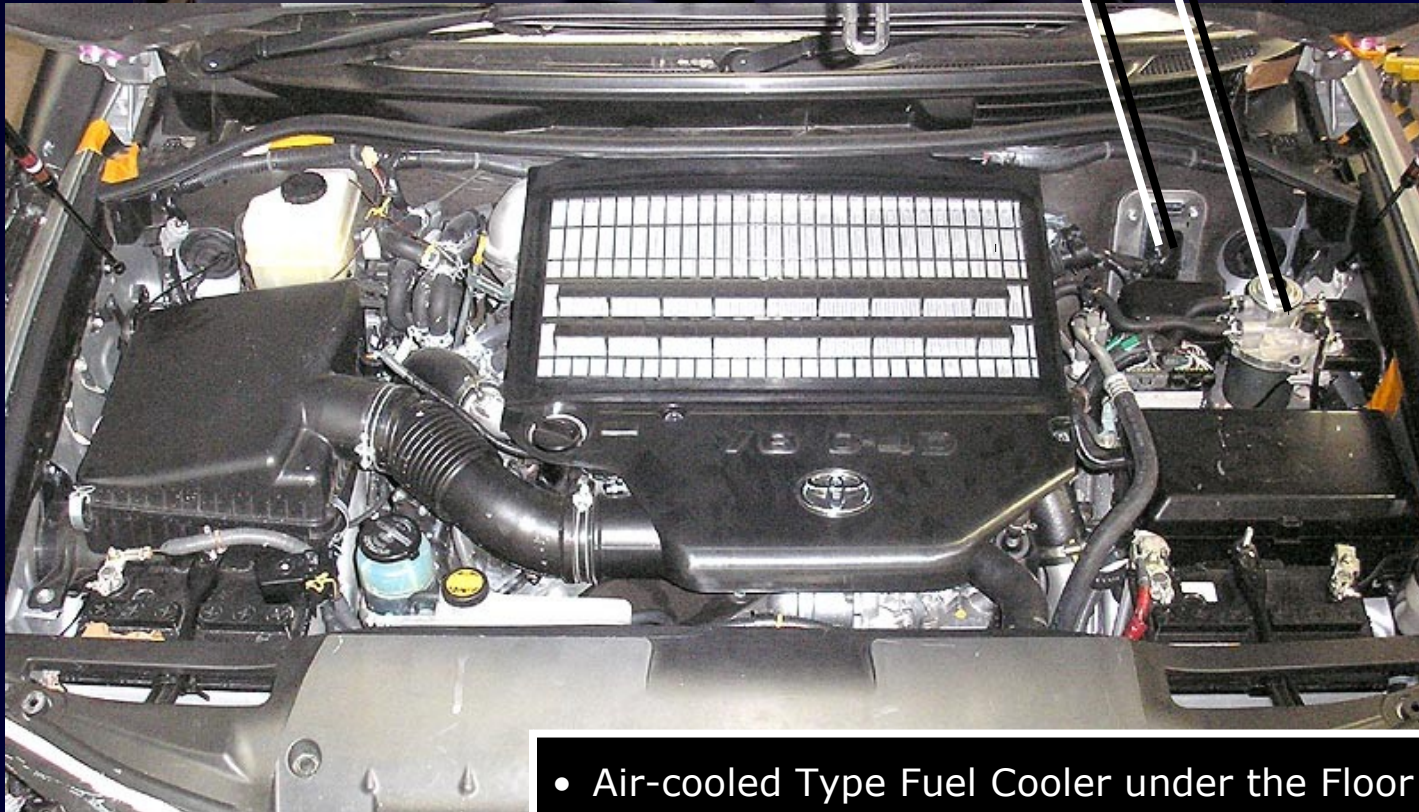
# Engine Overall

	-W	-Q	-V		-
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## ● Features

- Element Replacement Type Fuel Filter
- Fuel Filter Warning Switch

Dash Panel Penetration Installation for ECM



- Air-cooled Type Fuel Cooler under the Floor
- Fuel Pump in the Fuel Tank (*Dual Tank Model Only*)



# Engine Overall



## Specifications

Item	1VD-FTV	1VD-FTV	1HD-FTE
Model	New LAND CRUISER	LAND CRUISER (70 Series)	Previous Model
Destination	-W, -Q, -V, Gen	-Q	-W, -Q, Gen
No. of Cylinders and Arrangement	8-Cylinder, V type	←	6-Cylinder, In-line
Valve Mechanism	32-valve, DOHC, Chain and Gear Drive	←	24-valve, OHC, Belt and Gear Drive
Displacement cm <sup>3</sup> (cu. in.)	4461 (272.2)	←	4164 (254.0)
Bore x stroke mm (in.)	86.0 x 96.0 (3.39 x 3.78)	←	94.0 x 100.0 (3.70 x 3.94)
Compression Ratio	16.8 : 1	←	18.8 : 1
Emission Regulation	EUROIV, EUROIII (Except Europe)	←	EURO III
	-W	-	
	-Q	←	EURO II
	-V		-
Gen	EUROIII or EUROII or N.A. *	-	N.A.

\*: It is different depending on the countries

# Engine Overall

	-W	-Q	-V		-
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## Specifications

Item		1VD-FTV	1VD-FTV	1HD-FTE
Model		New LAND CRUISER	LAND CRUISER (70 Series)	Previous Model
Destination		-W, -Q, -V, Gen	-Q	-W, -Q, Gen
Combustion Chamber		Direct Injection Type	←	←
Fuel System		Common-rail Type	←	Distributor Type
Turbocharger		VN type 2 Turbochargers	VN Type Turbocharger	Conventional Type Turbocharger
Max. Output	-W AT	210 @ 3600	-	-
	-W*, AT	195 @ 3400	-	-
kW @ rpm	-Q MT	-	151 @ 3400	150 @ 3400
	-V, AT	173 @ 3200	-	-
Max. Torque	Gen MT	162 @ 3600	-	-
	-W AT	650 @ 1600 - 2800	-	-
N·m @ rpm	-W*, AT	650 @ 1600 - 2600	-	-
	-Q MT	-	430 @ 1200 - 3200	430 @ 1400 - 3200
	-V, AT	615 @ 1800 - 2200	-	-
	Gen MT	430 @ 1200 - 3600	-	-

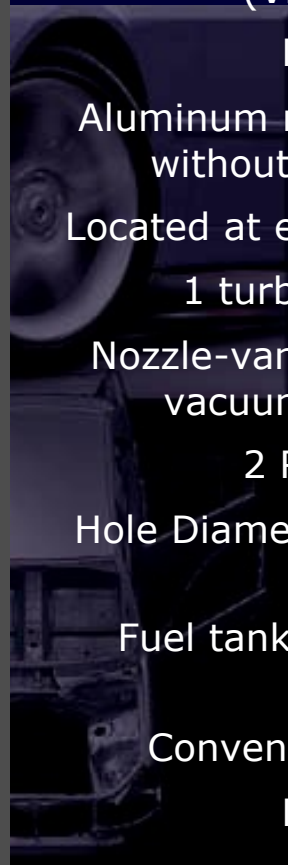
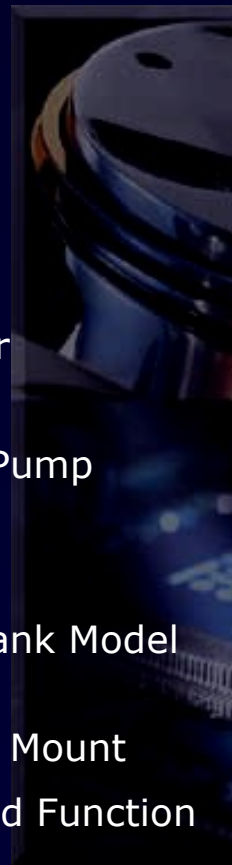
\*: Only for -W models equipped with a pre-cleaner

# Reference (Engine Overall)

		-Q			
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## Major Difference From LAND CRUISER (VDJ70)

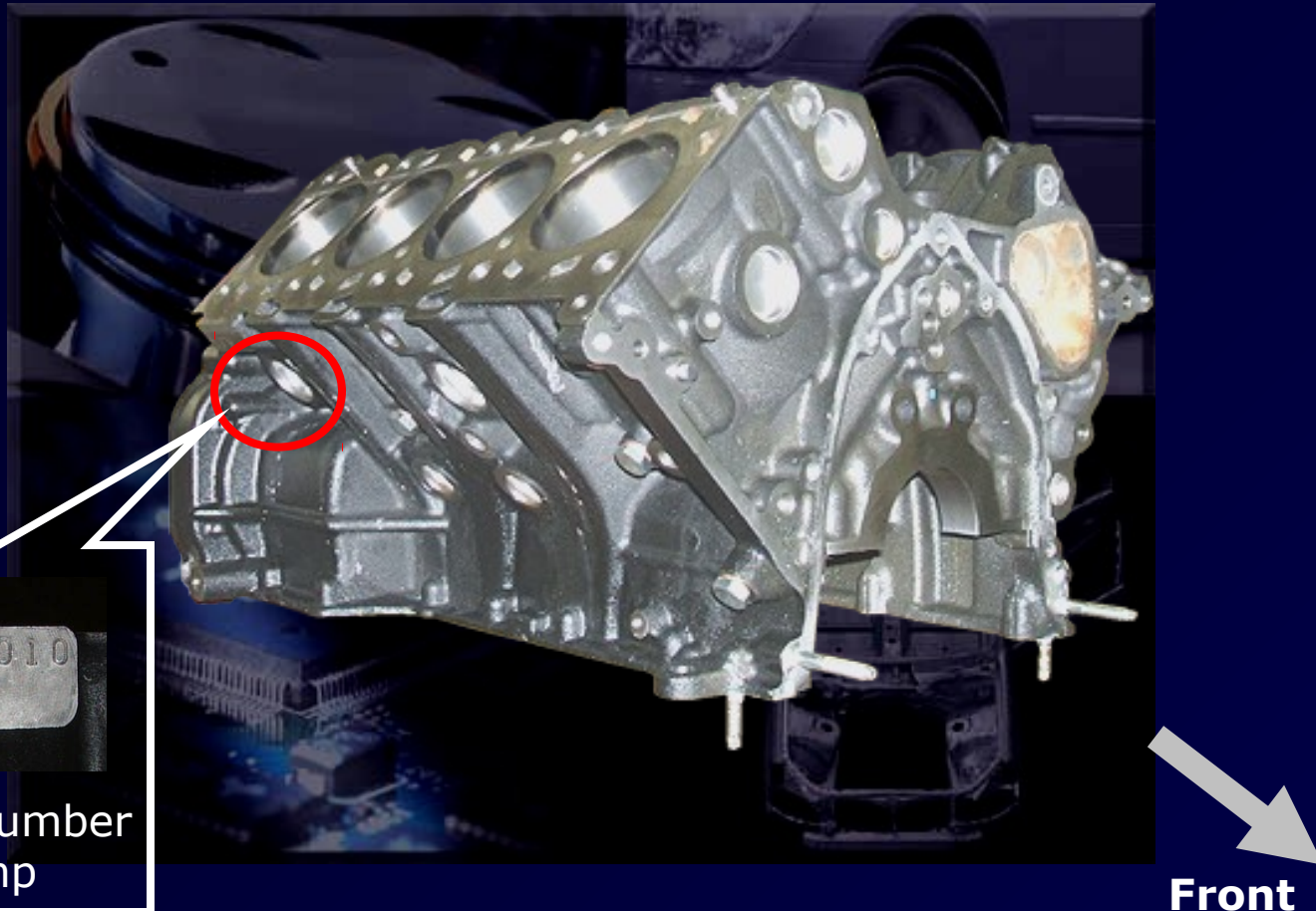
Item	1VD-FTV	1VD-FTV
Model	New LAND CRUISER (VDJ200)	LAND CRUISER 70 Series (VDJ7#)
Timing Gear	Scissors gear for idle gear	N.A.
Oil Filter	Plastic made filter cap with drain plug Located at engine front side	Aluminum made filter cap without drain plug Located at engine rear side
Turbocharger	2 turbochargers Nozzle-vane is driven by DC motor	1 turbocharger Nozzle-vane is driven by vacuum actuator
Scavenging Pump	1 Rotor	2 Rotors
Injector	Hole Diameter: 0.113 mm	Hole Diameter: 0.105 mm
Fuel Tank (Dual Fuel Tank Model Only)	Fuel pump in the main tank for fuel transfer	Fuel tank select valve
Front Engine Mount	2 Electrical Hydraulic Type	Conventional Type
Cranking Hold Function	With	N.A.
Diagnosis Communication	CAN	Serial



## Engine Proper

	-W	-Q	-V		-
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- Cylinder Block
  - High strength compacted vermicular graphite cast iron is used for weight reduction

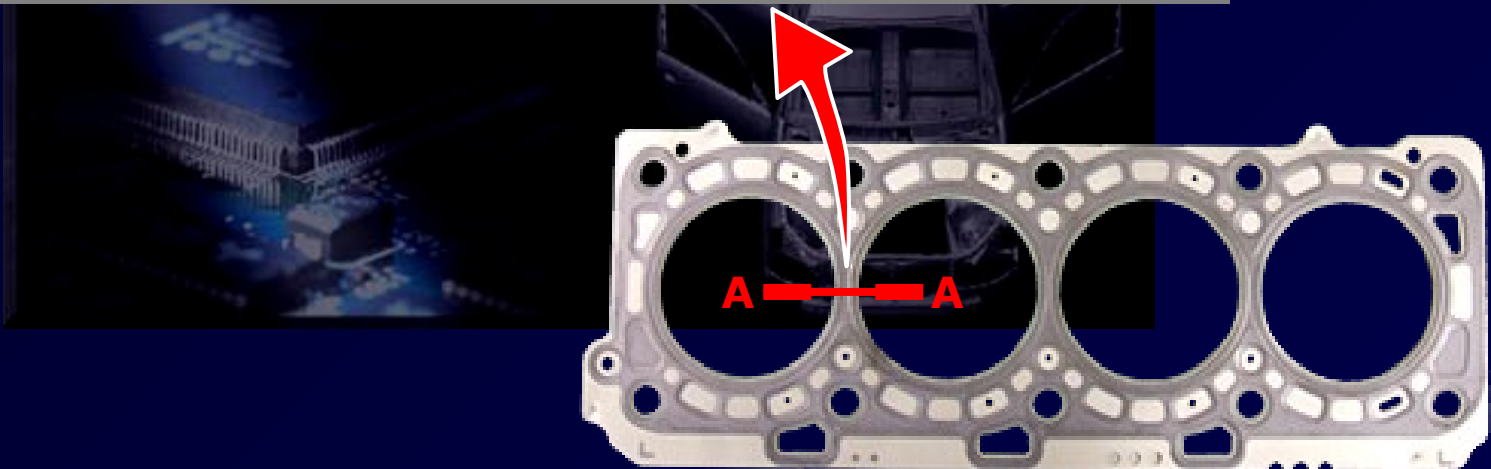
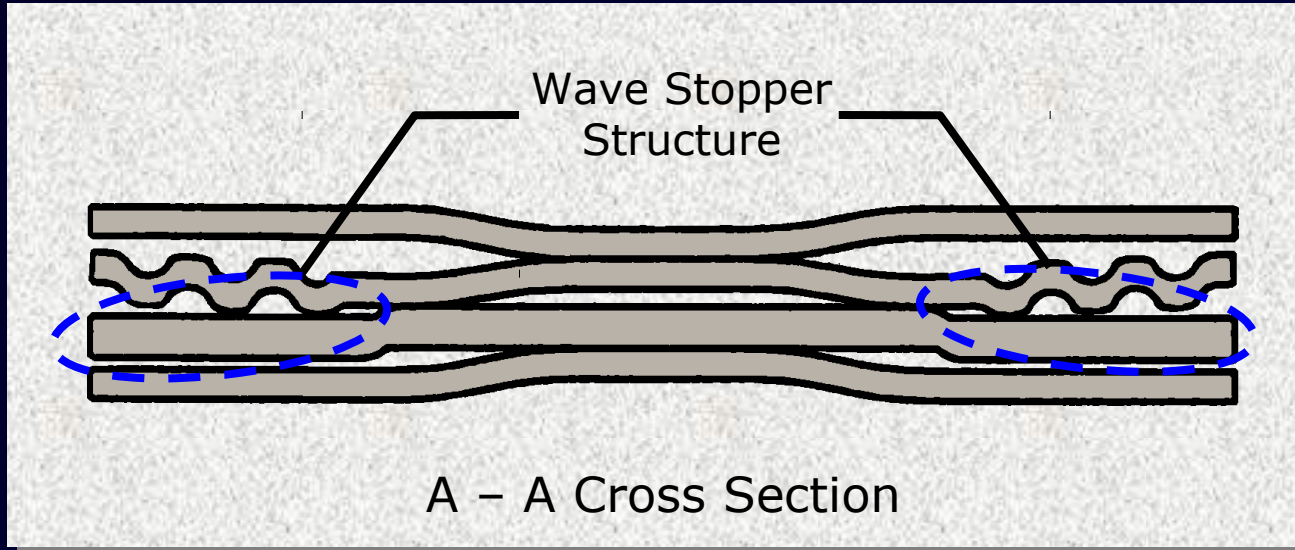




## Engine Proper

	-W	-Q	-V		-
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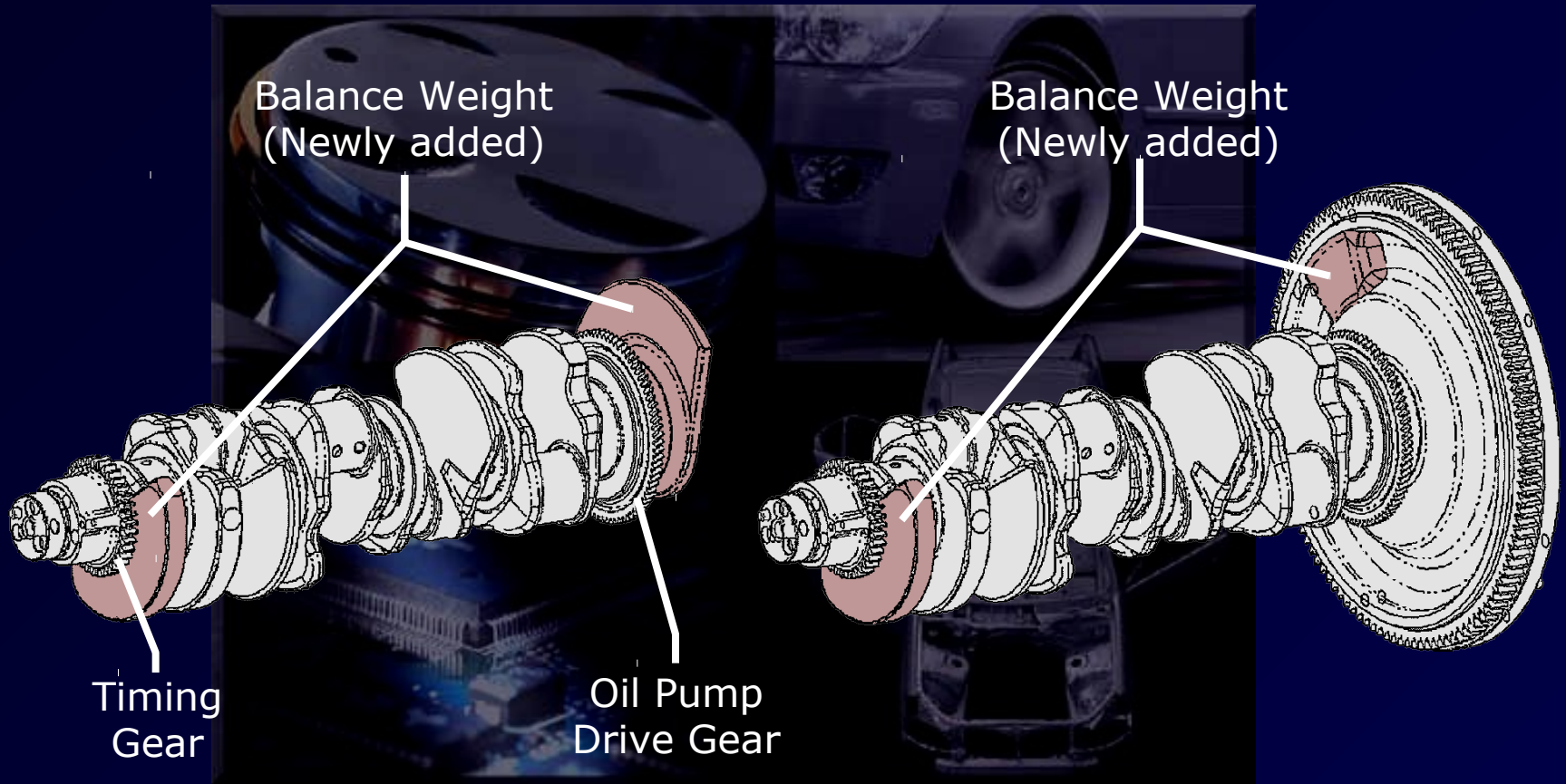
- Cylinder Head Gasket
  - Wave stopper structure is used around the cylinder bore to improve sealing performance



# Engine Proper

	-W	-Q	-V		-
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- Crankshaft and Flywheel
  - Balance weight is appropriately provided to reduce vibration



**AT Model**

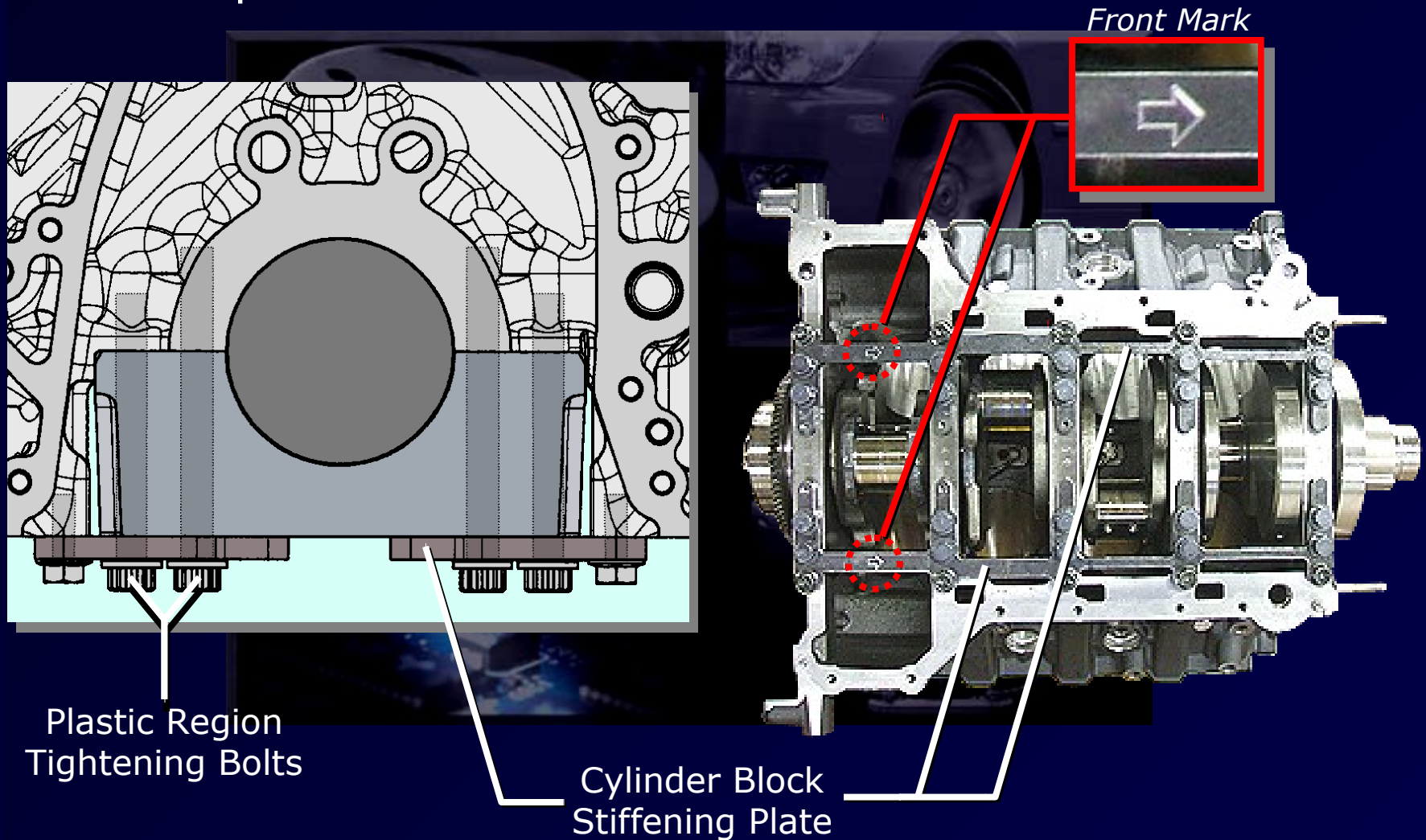
**MT Model**



## Engine Proper

	-W	-Q	-V		-
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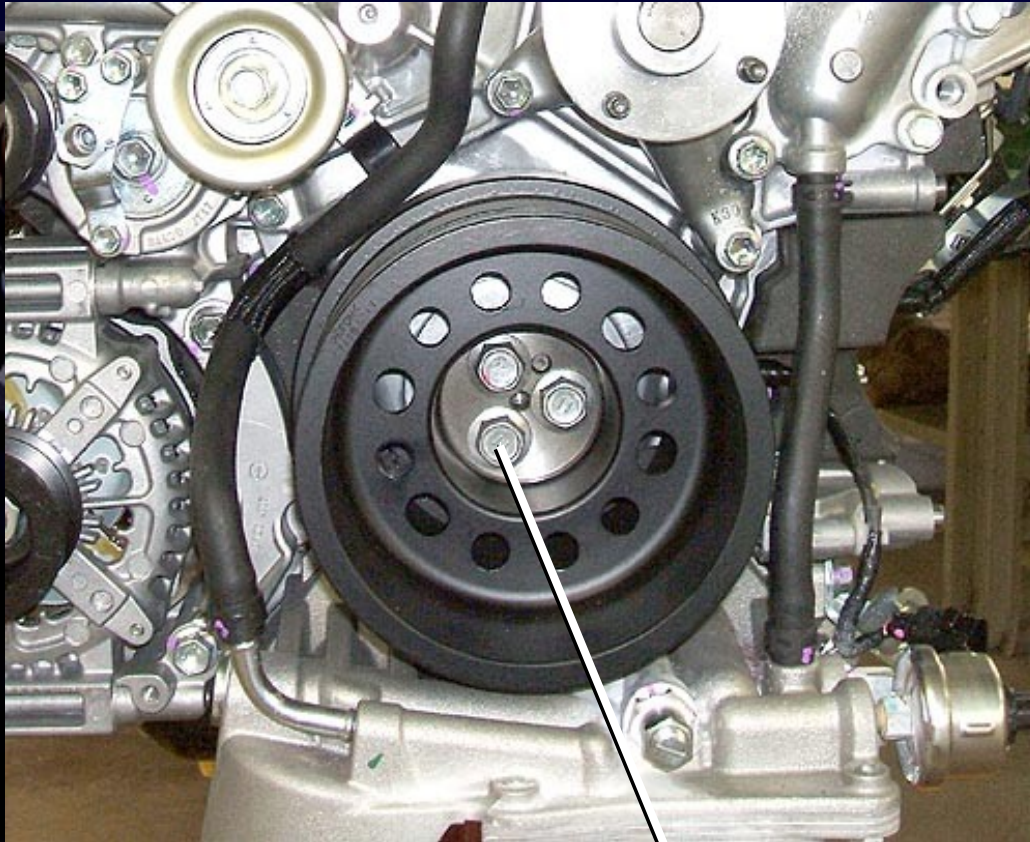
- Cylinder Block Stiffening Plate
  - This plate connects the bearing cap and cylinder block skirt portion to reduce noise and vibration



## Engine Proper

	-W	-Q	-V		-
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- Crankshaft Pulley
  - Installed by 3 bolts to reduce tightening torque



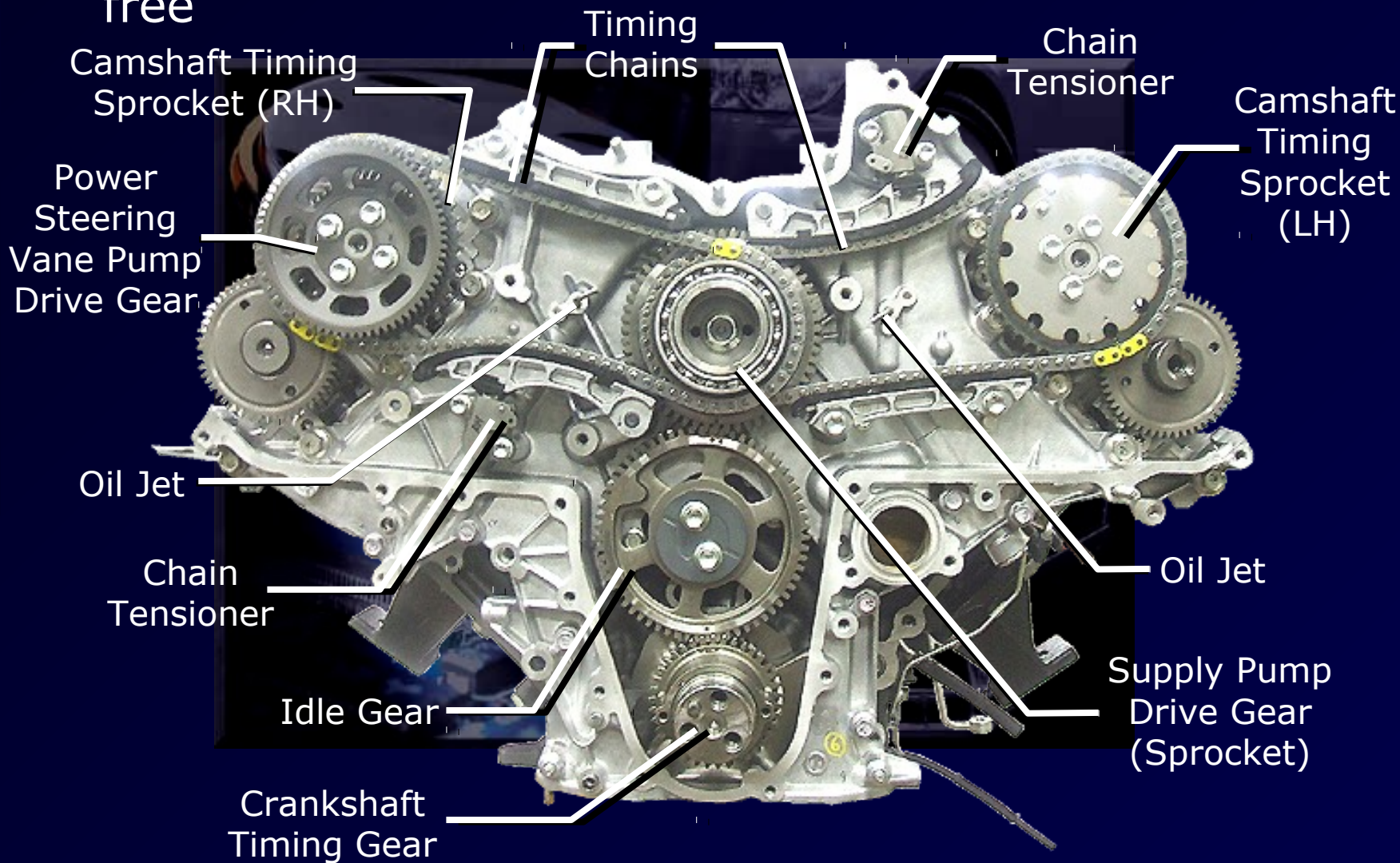
Installation with 3 bolts  
(Torque: 115 N·m x3)



# Valve Mechanism

-W	-Q	-V		-
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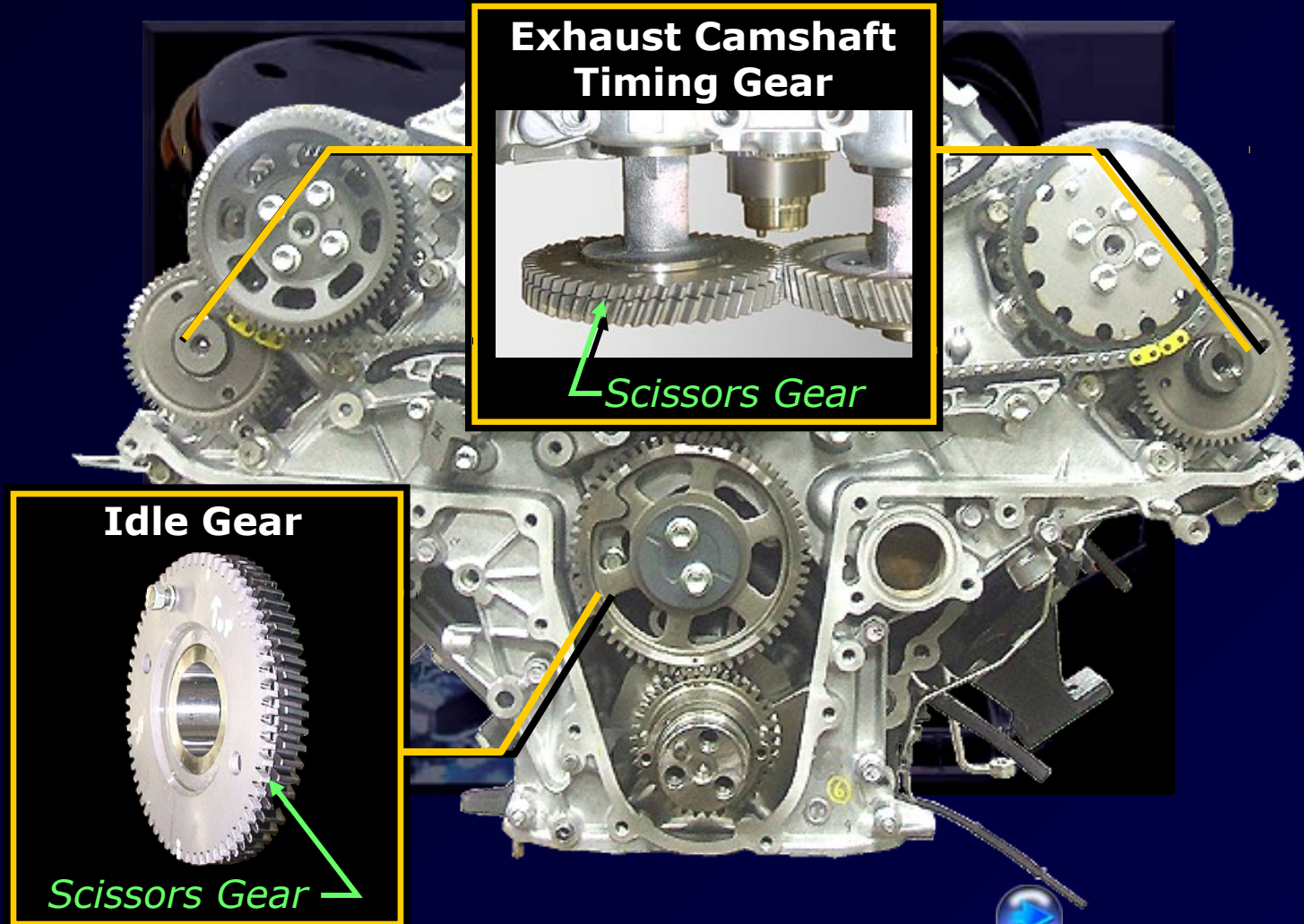
- Timing Gear and Chain
  - Timing gear and chain is used to realize maintenance-free



# Valve Mechanism

	-W	-Q	-V		-
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- Timing Gear and Chain
  - Scissors gear is used for exhaust camshaft timing gear and idle gear to reduce gear noise

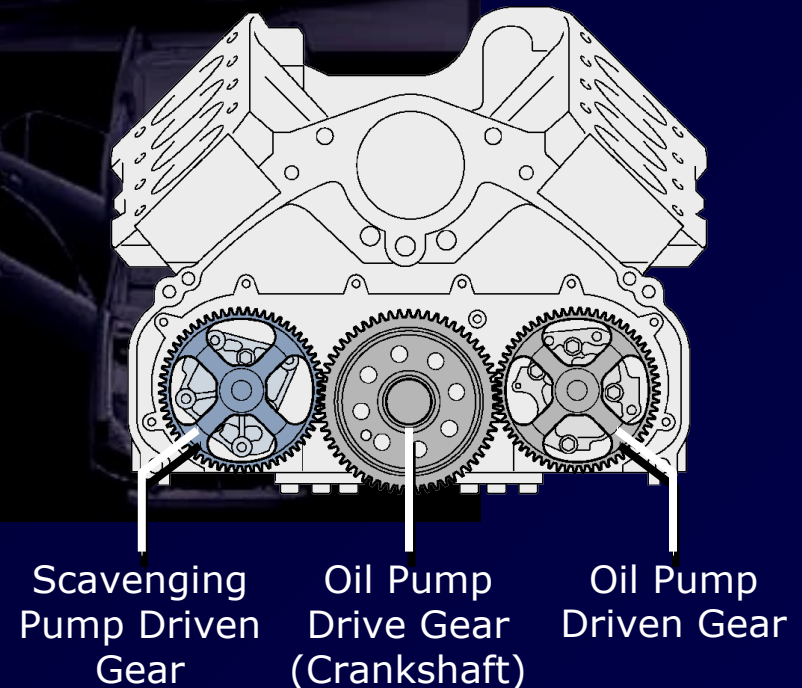
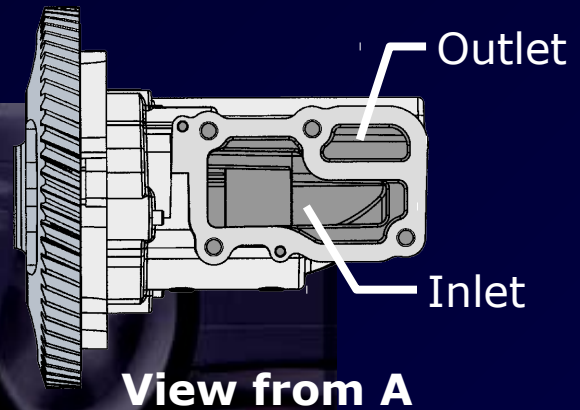
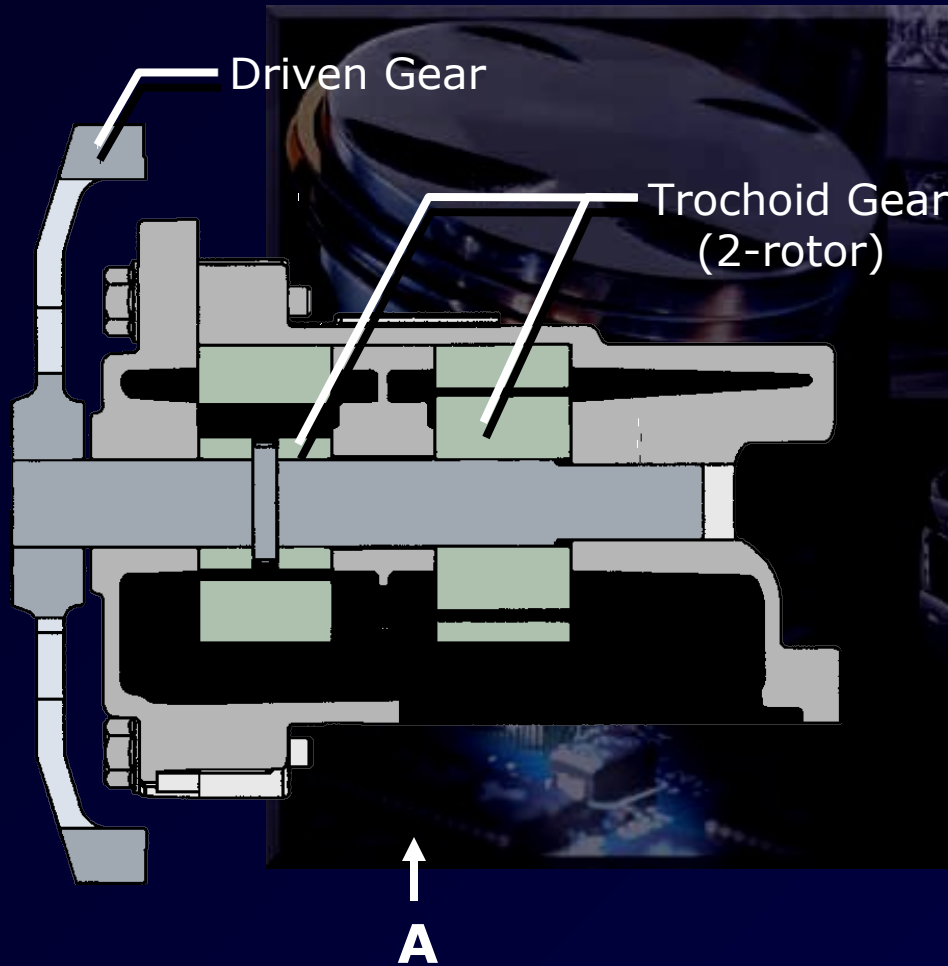


# Lubrication System

	-W	-Q	-V		-
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## ● Oil Pump

- Compact and high efficiency trochoid gear (2-rotor) type oil pump is used

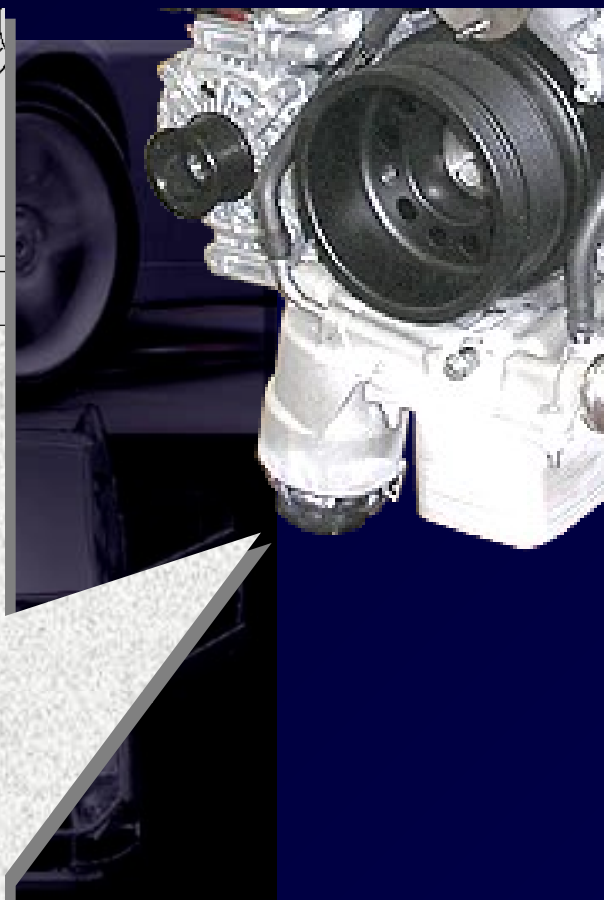
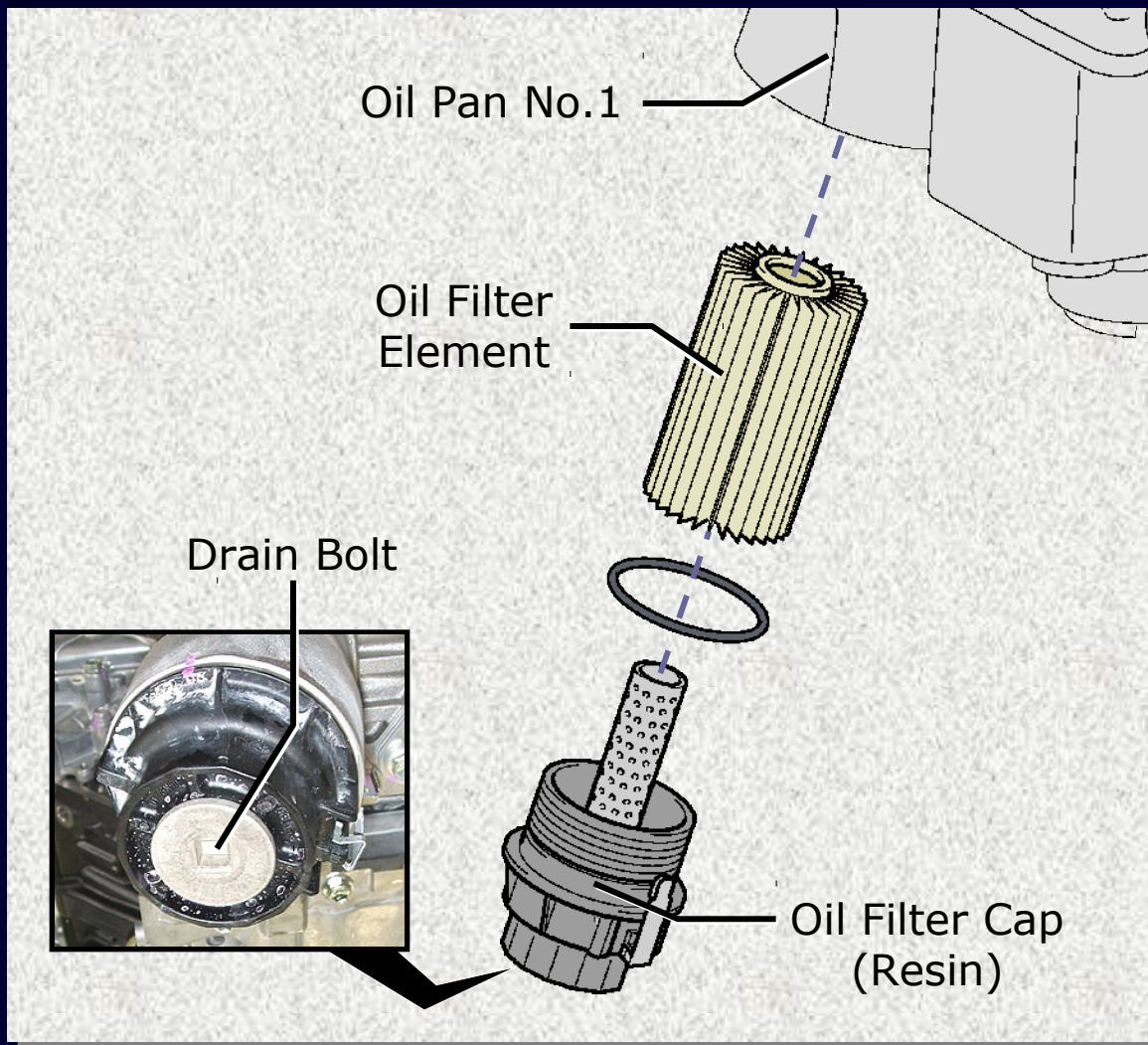


# Lubrication System

	-W	-Q	-V		-
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- Oil Filter

- Element replacement type oil filter is used

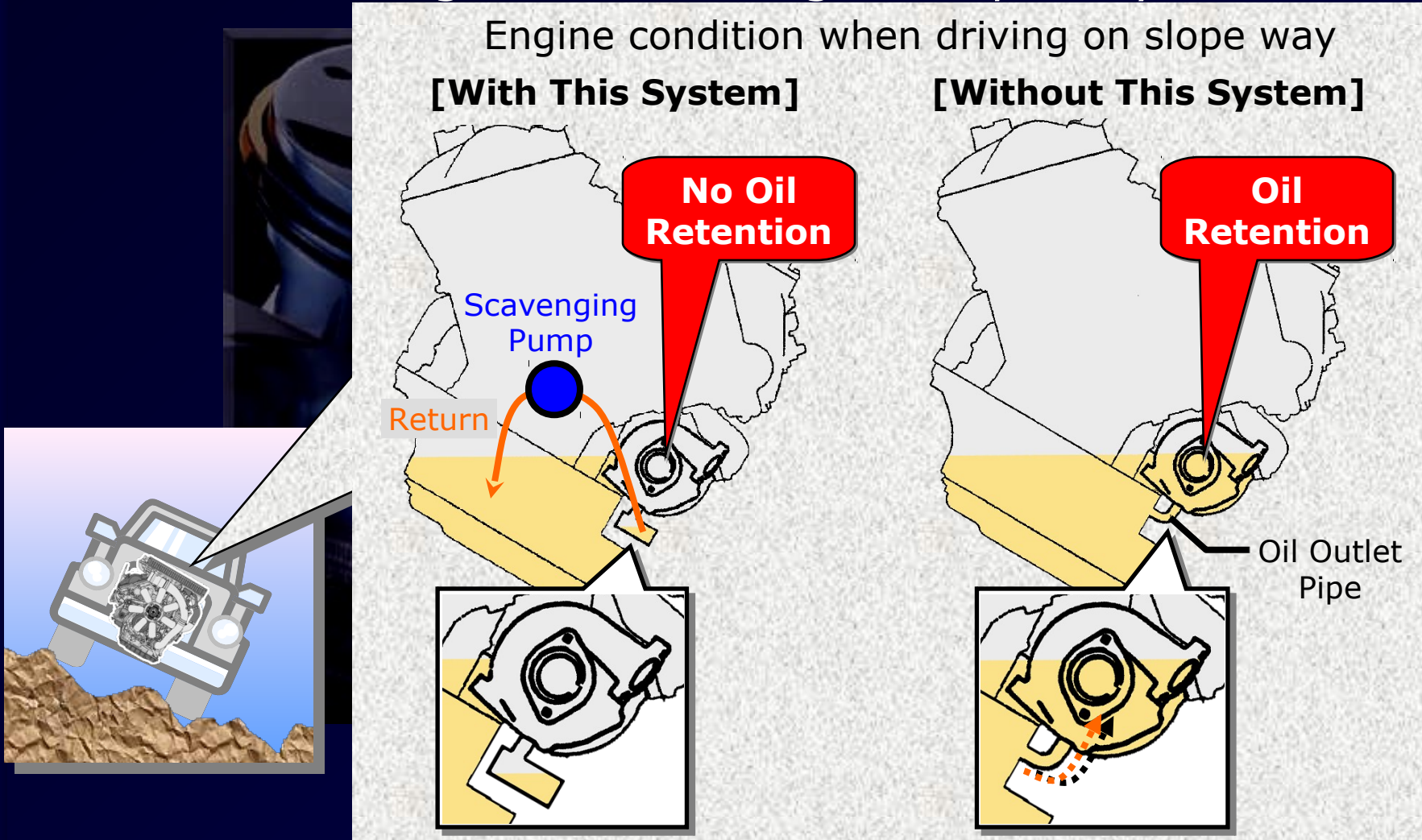




# Lubrication System

	-W	-Q	-V		-
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- Scavenging Pump
  - This system is used to prevent oil from retaining in the turbocharger when driving on slope way

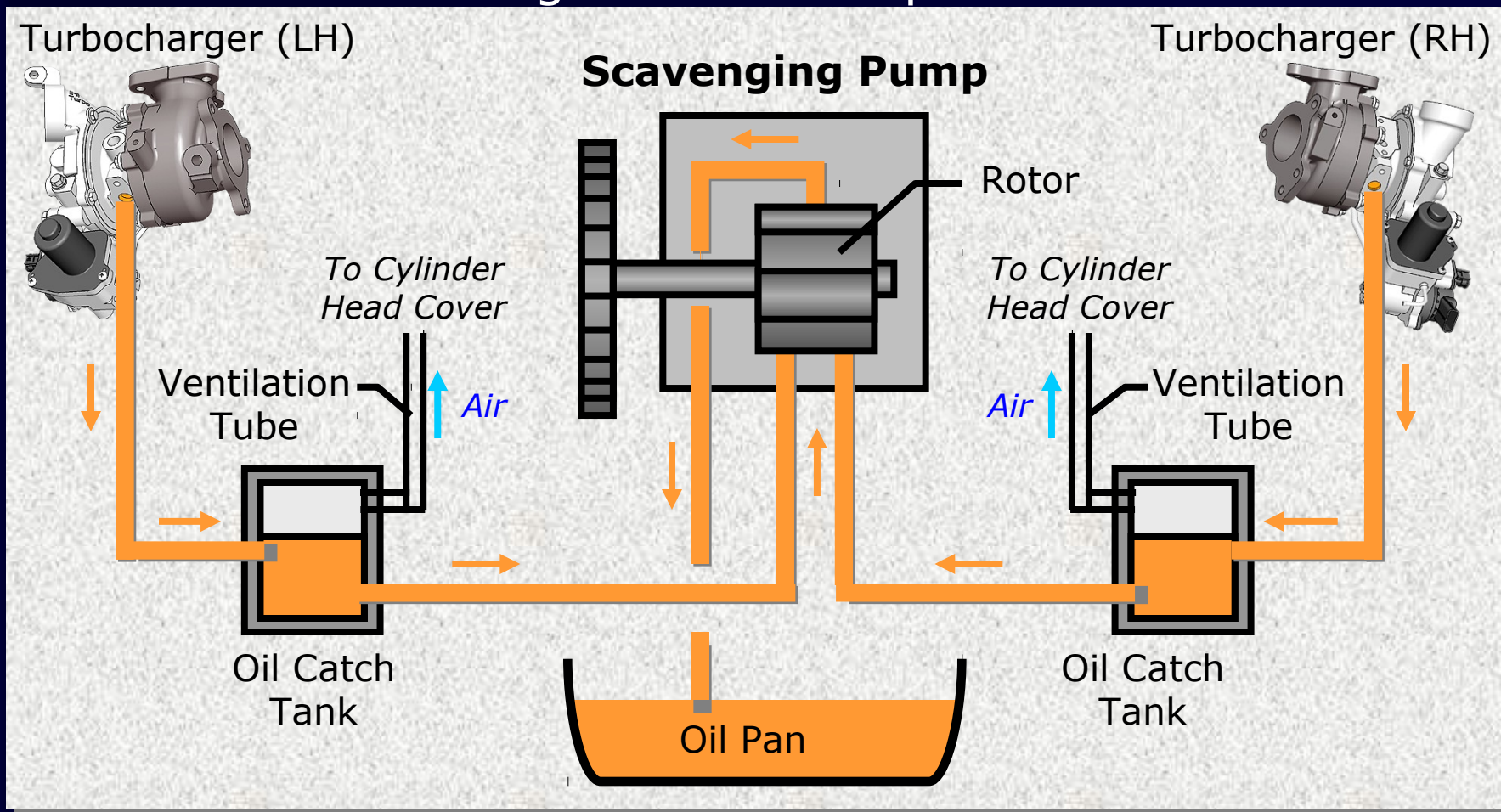


# Lubrication System

-W	-Q	-V		-
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## ● Scavenging Pump

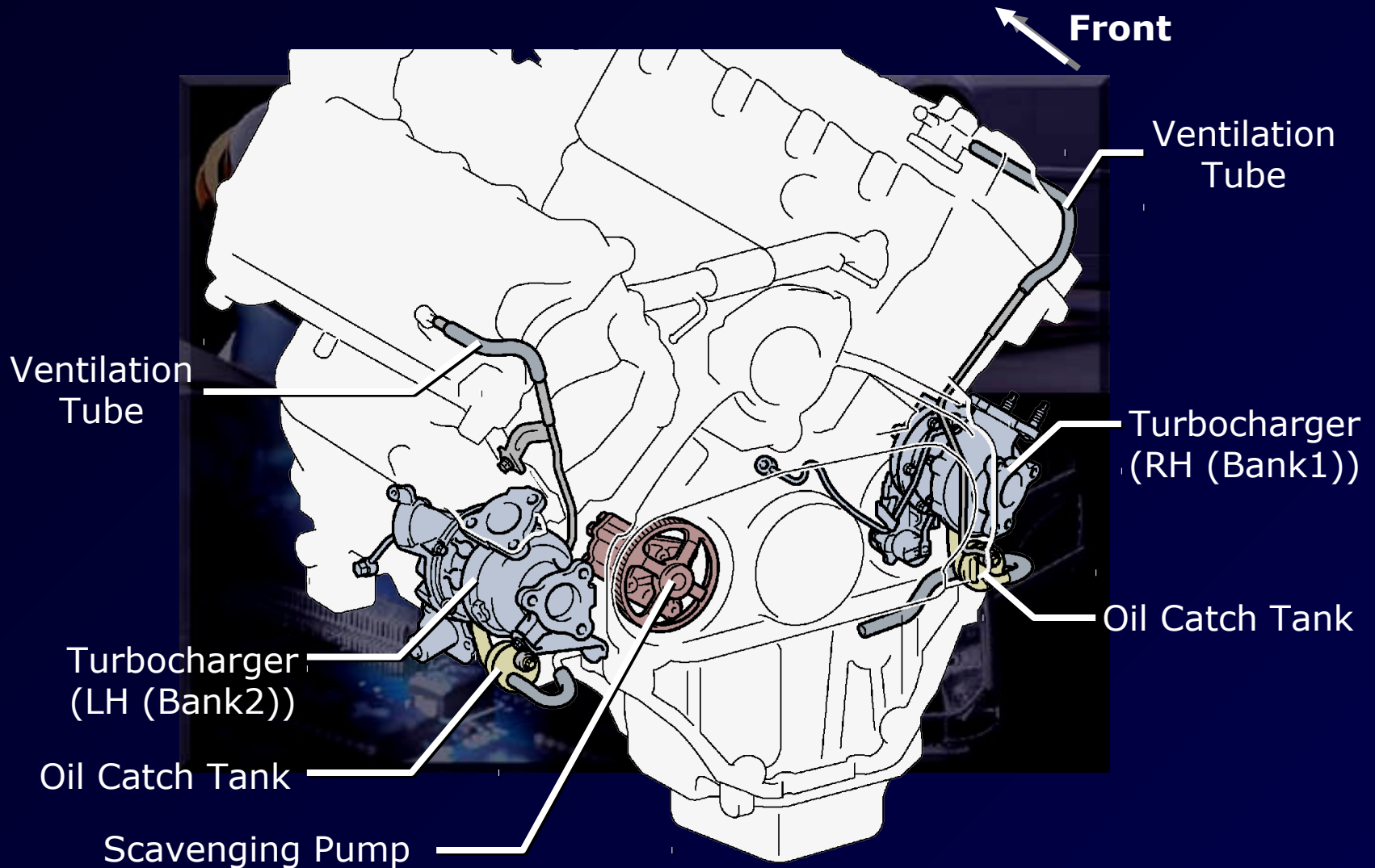
- Scavenging pump sucks the engine oil in the catch tank and discharge it to the oil pan



# Lubrication System

	-W	-Q	-V		-
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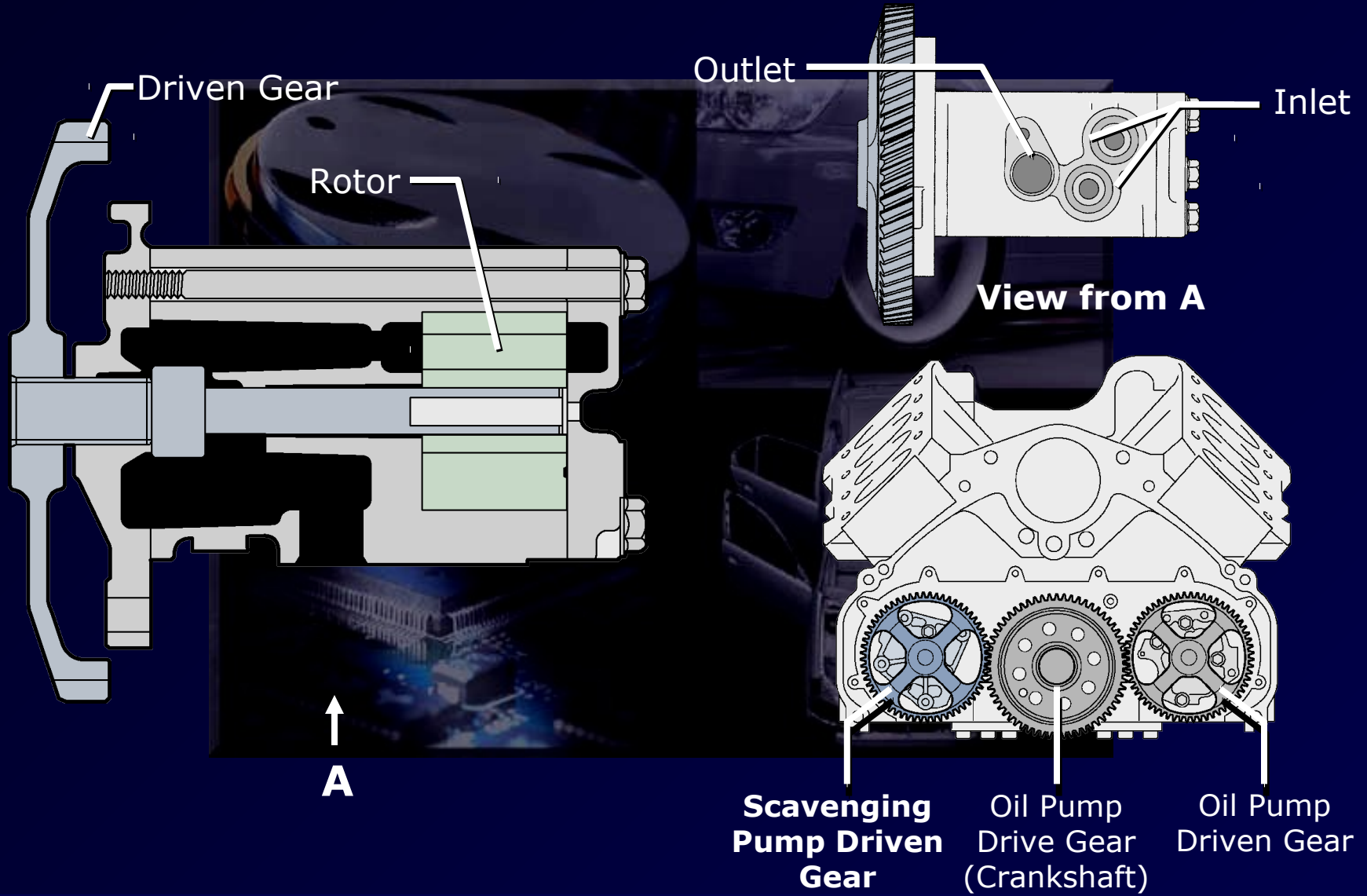
- Scavenging Pump  
– Parts Location



# Lubrication System

-W	-Q	-V		-
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- Scavenging Pump
  - Scavenging pump is driven by crankshaft

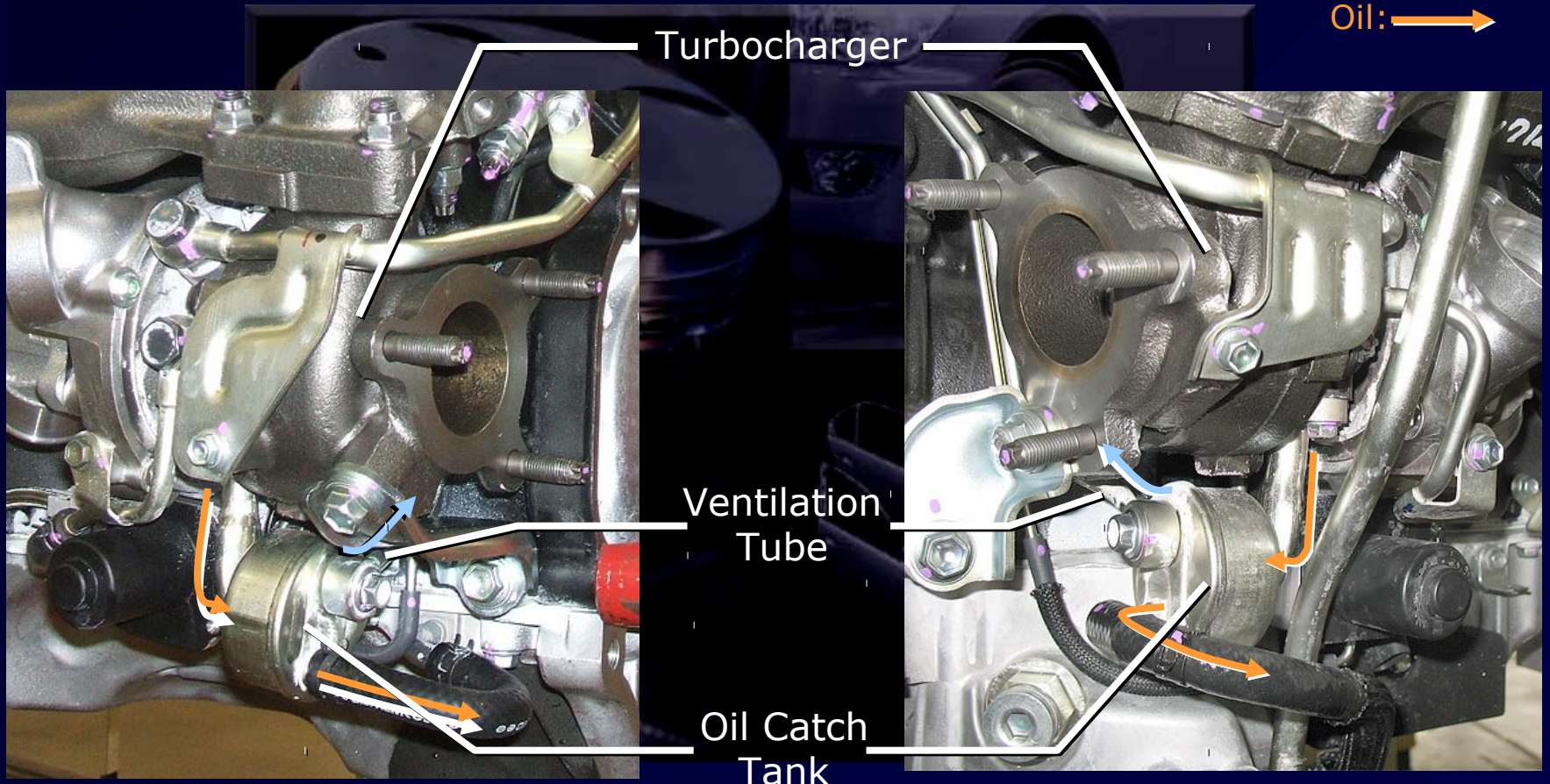


# Lubrication System

	-W	-Q	-V		-
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- Scavenging Pump
  - Oil catch tank separates the engine oil to air-liquid

Air:   
 Oil: 



**LH Side (Bank2)**

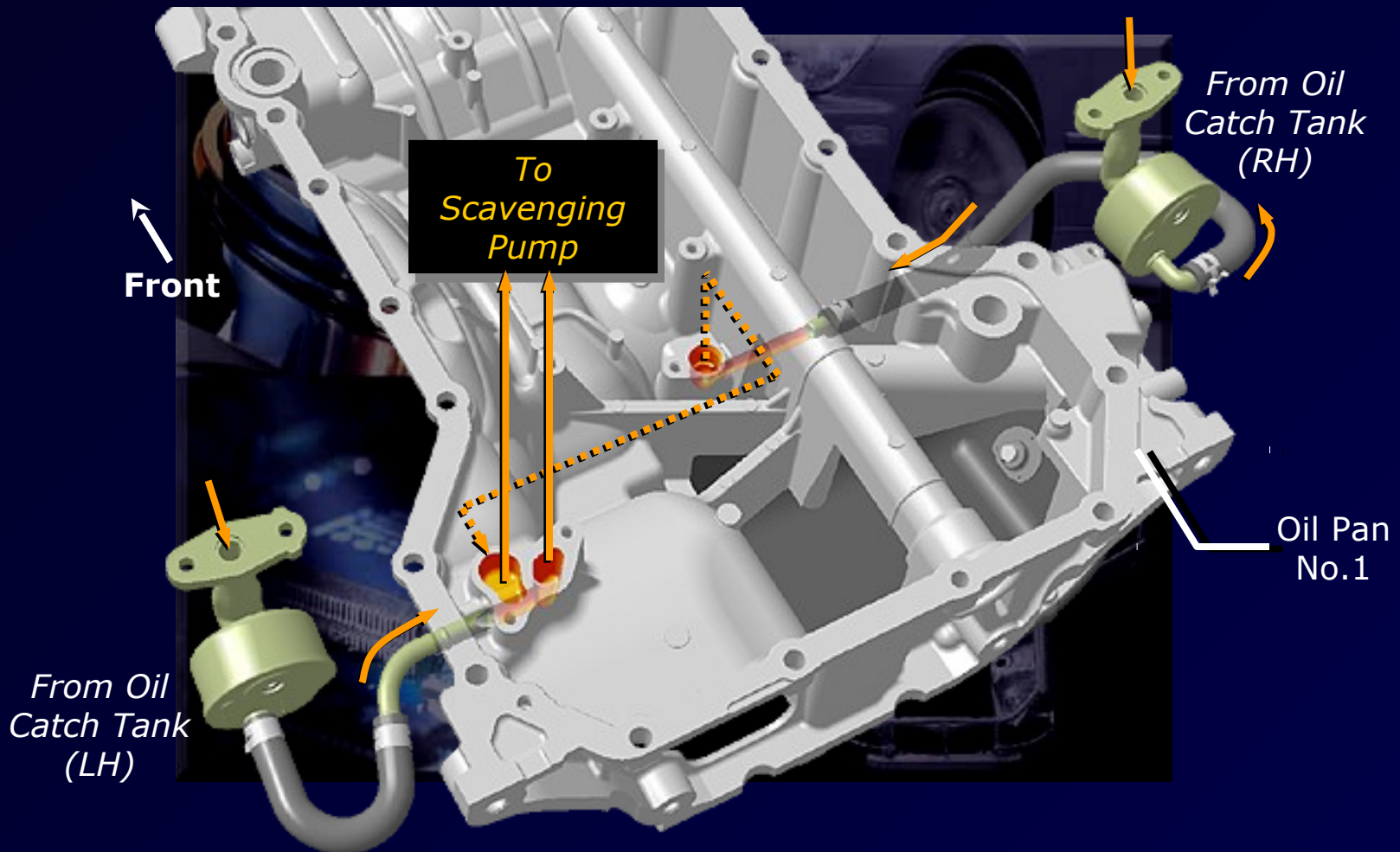
**RH Side (Bank1)**



## Reference (Lubrication System)

	-W	-Q	-V		-
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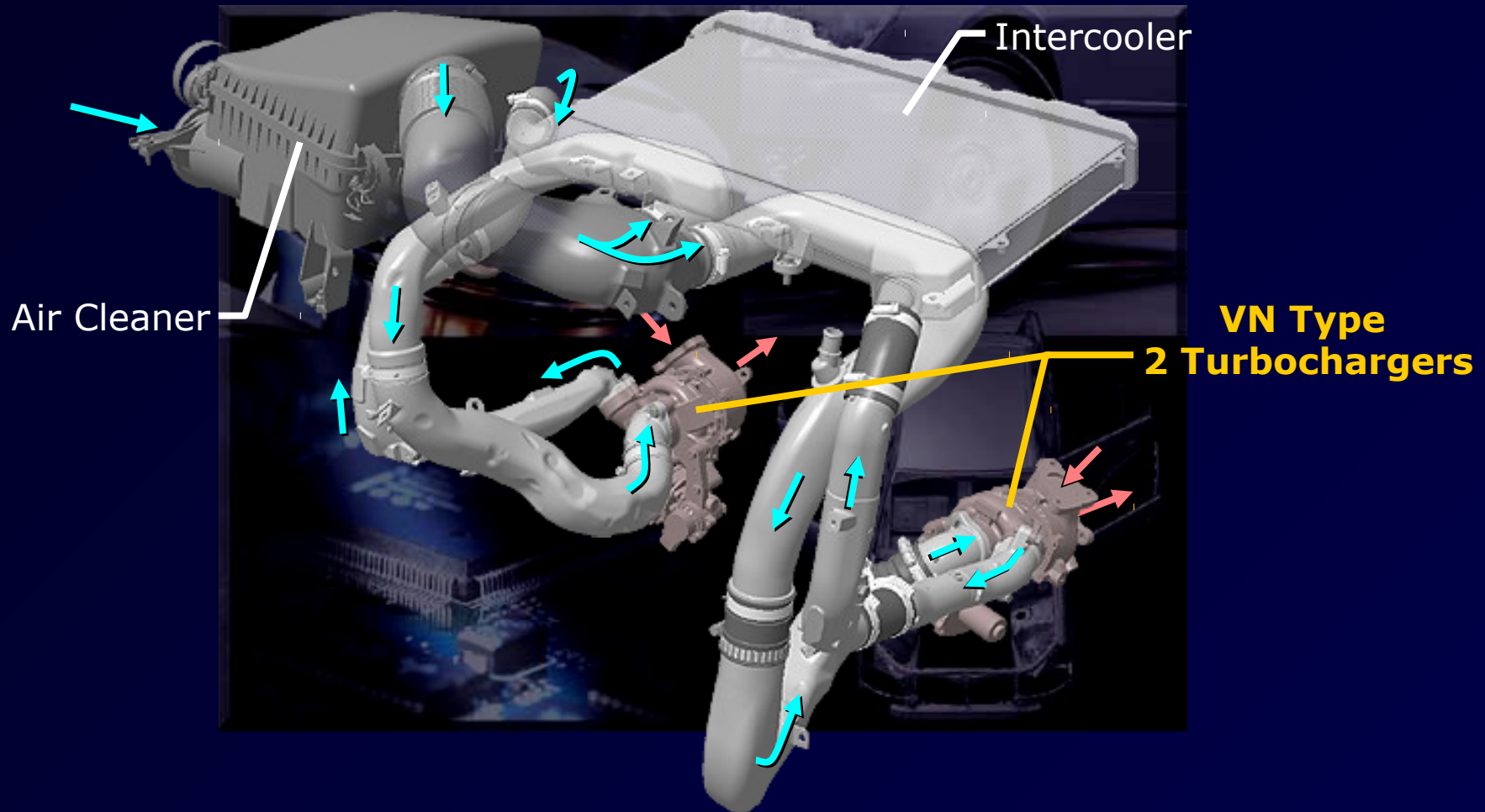
- Scavenging Pump
  - Oil flow from oil catch tank to scavenging pump



# Intake and Exhaust System

	-W	-Q	-V		-
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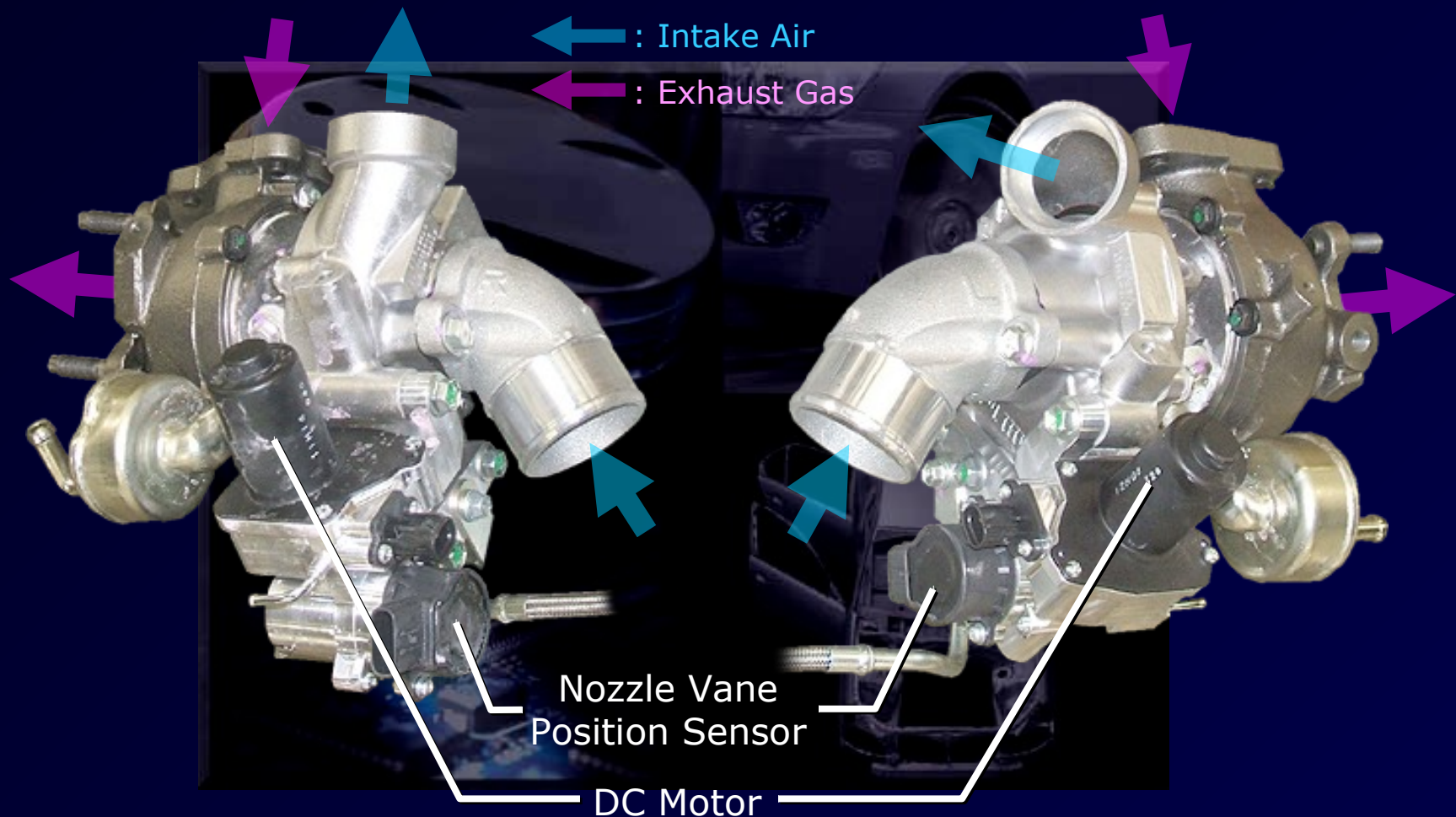
- Variable Nozzle Vane Type Turbocharger
  - VN (Variable Nozzle-vane) type 2 turbochargers



# Intake and Exhaust System

	-W	-Q	-V		-
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- Variable Nozzle Vane Type Turbocharger
  - Nozzle Vane is driven by DC motor



**RH Side (Bank1)**

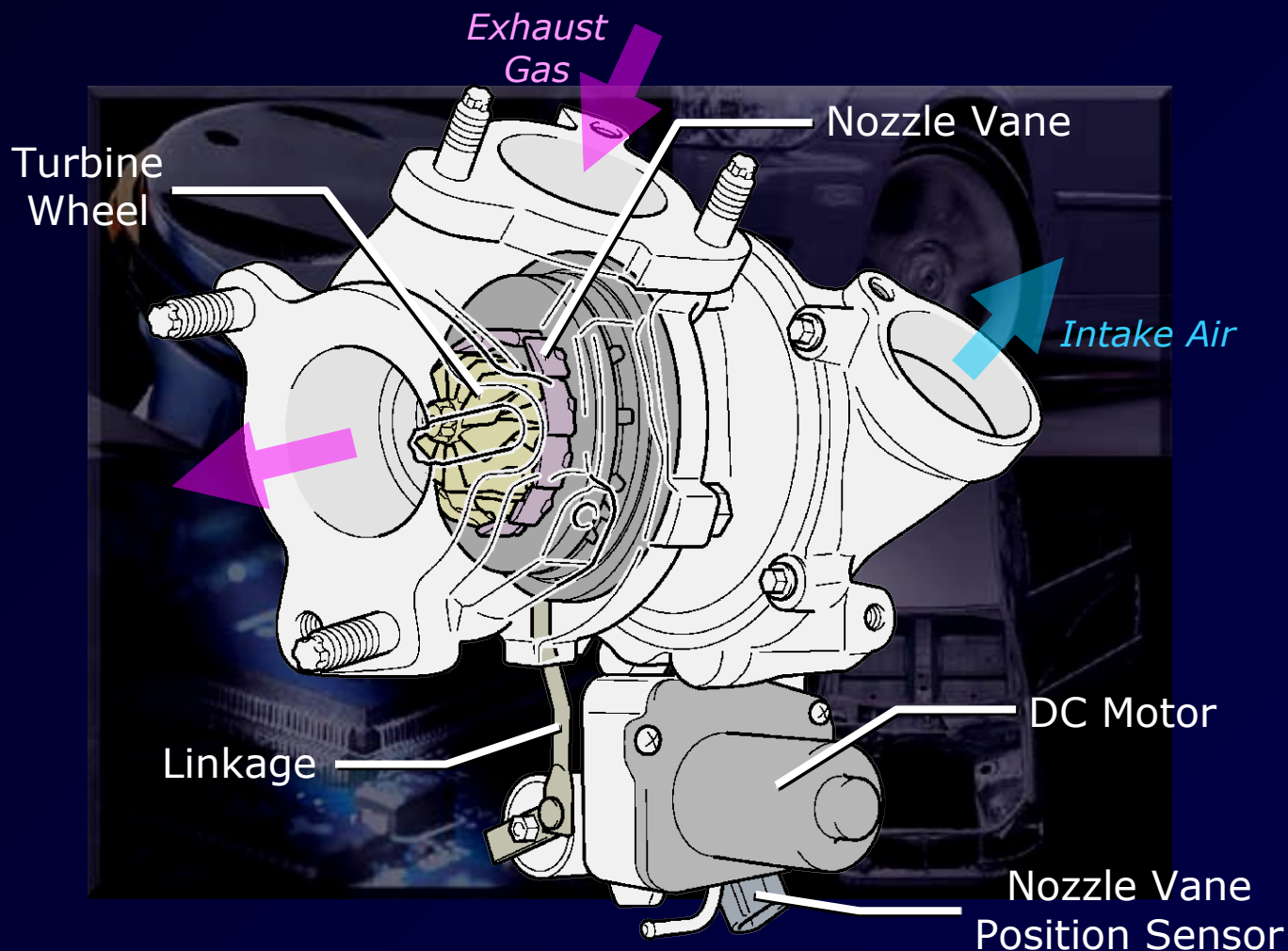
**LH Side (Bank2)**



# Intake and Exhaust System

	-W	-Q	-V		-
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- Variable Nozzle Vane Type Turbocharger – Construction (RH Side (Bank1))



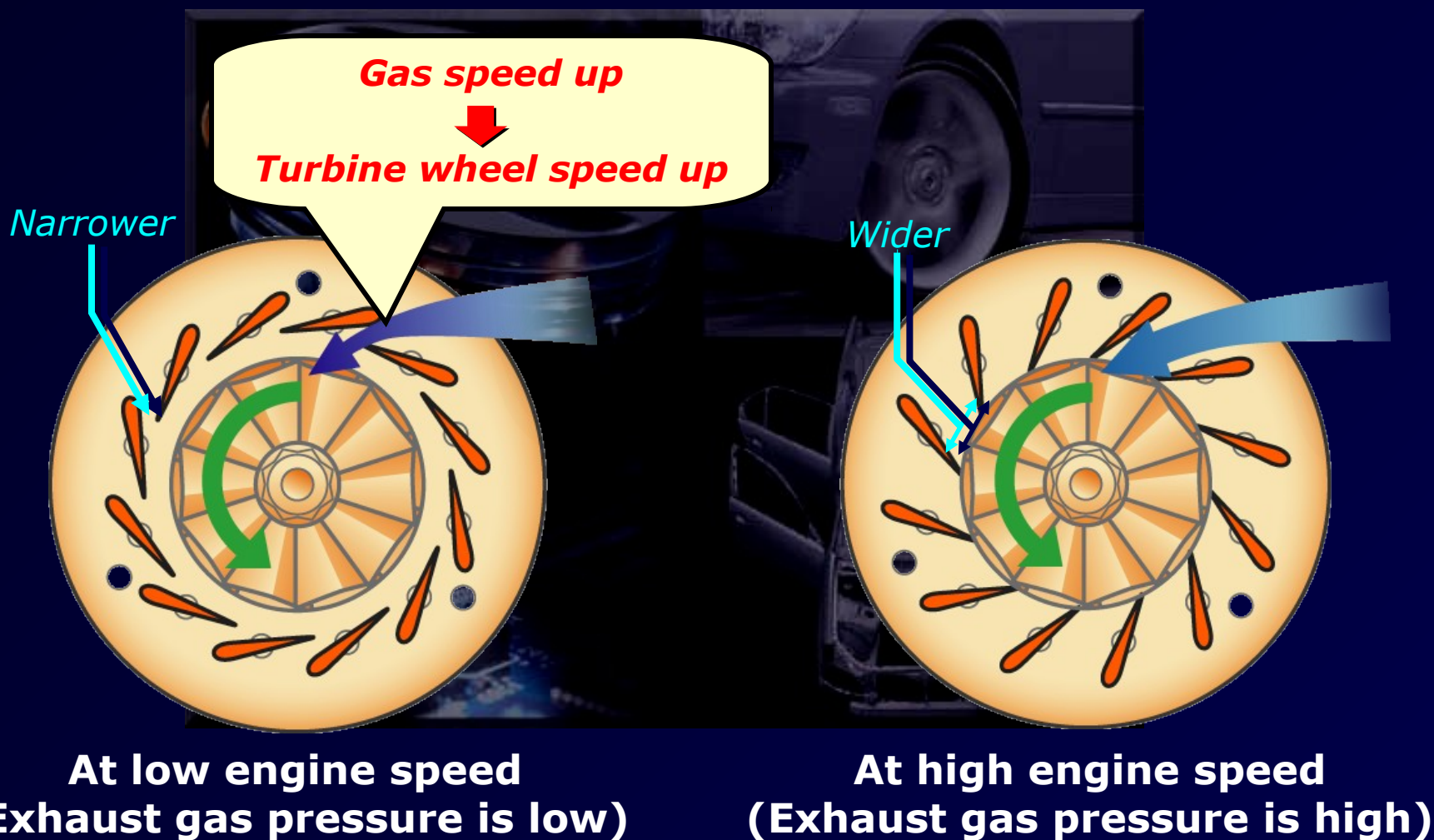
**RH Side (Bank1)**



# Intake and Exhaust System

	-W	-Q	-V		-
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- Variable Nozzle Vane Type Turbocharger
  - Nozzle angle changes to increase exhaust gas speed
  - VN turbo can be effected at lower engine speed



# Intake and Exhaust System

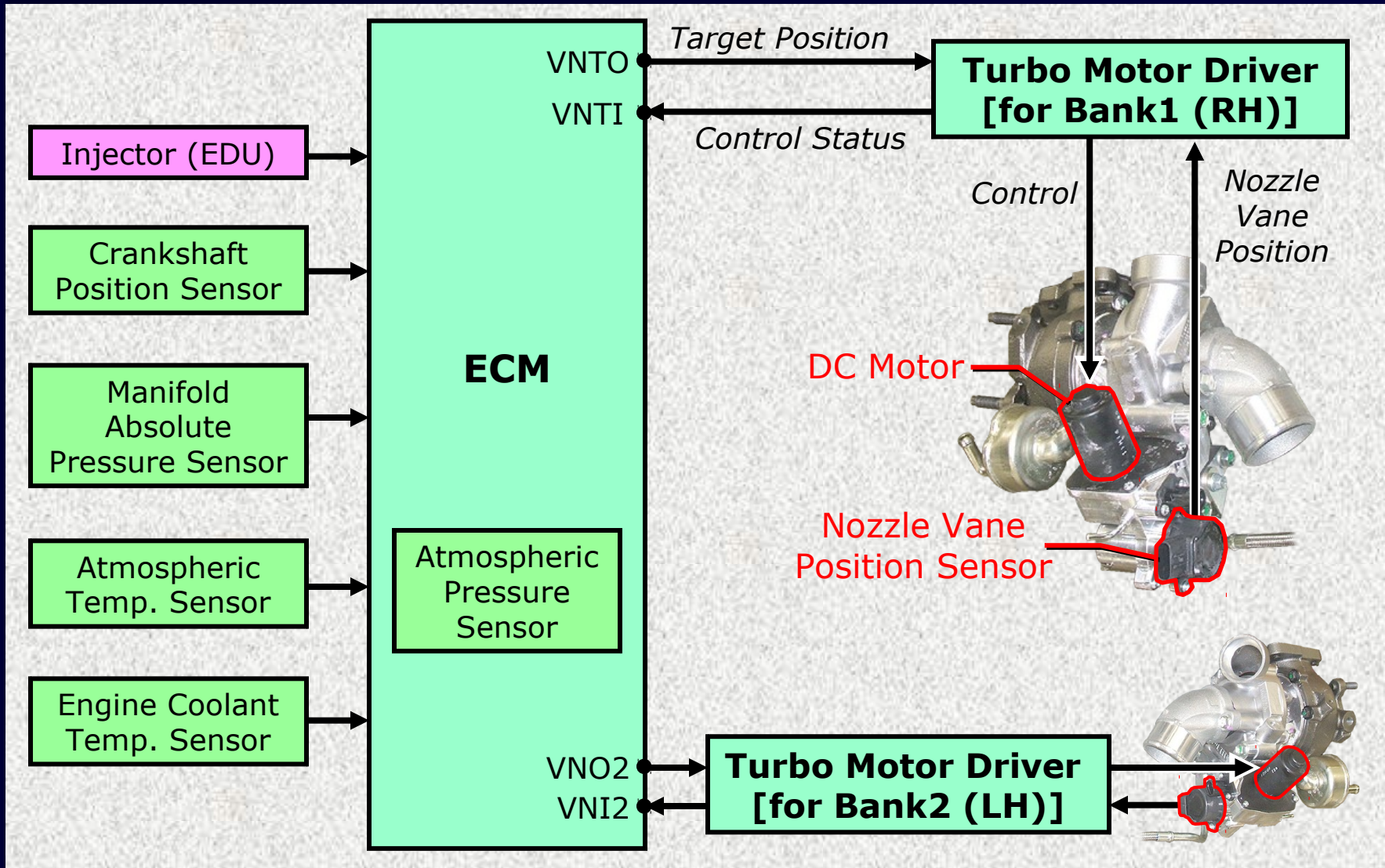
-W

-Q

-V

-\_

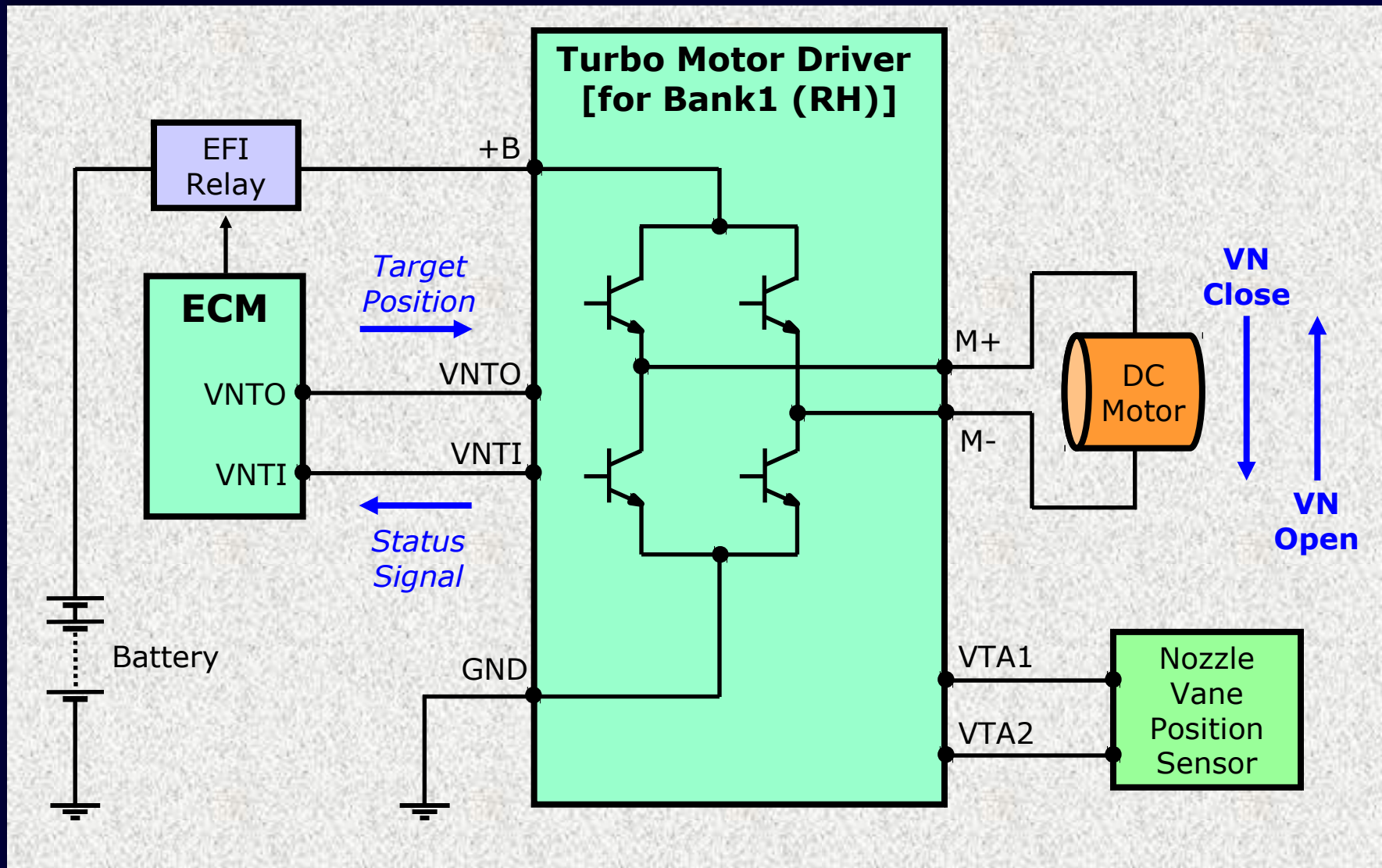
- Variable Nozzle Vane Type Turbocharger – Control



## Reference (Intake and Exhaust System)

	-W	-Q	-V		-
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- Variable Nozzle Vane Type Turbocharger
  - System diagram of turbo motor driver



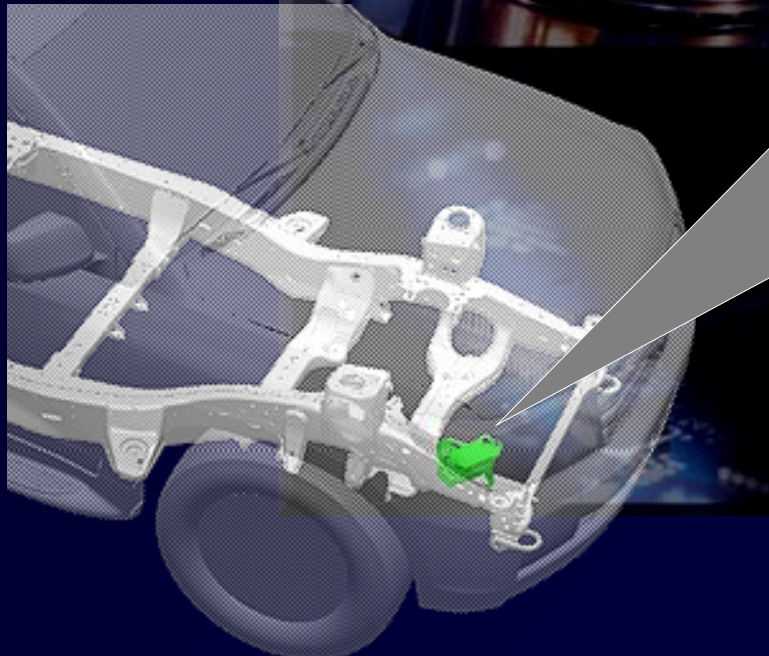
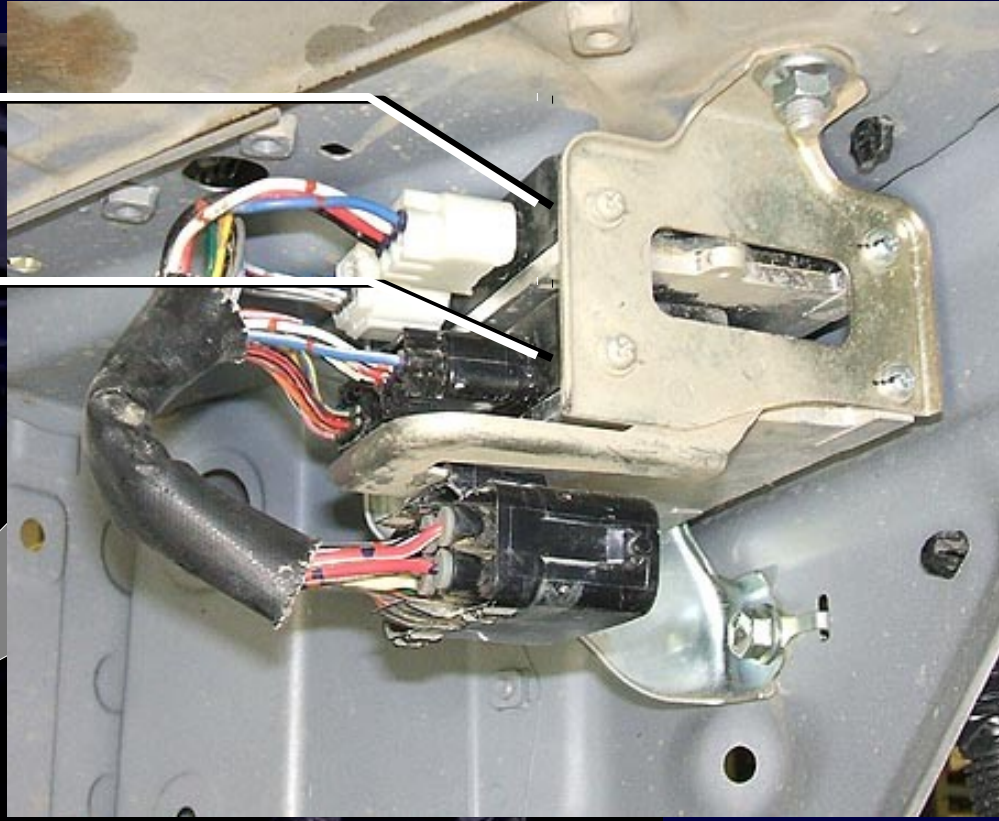
# Reference (Intake and Exhaust System)

	-W	-Q	-V		-
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- Variable Nozzle Vane Type Turbocharger  
– Location of turbo motor driver

Turbo Motor Driver  
(For Bank1)

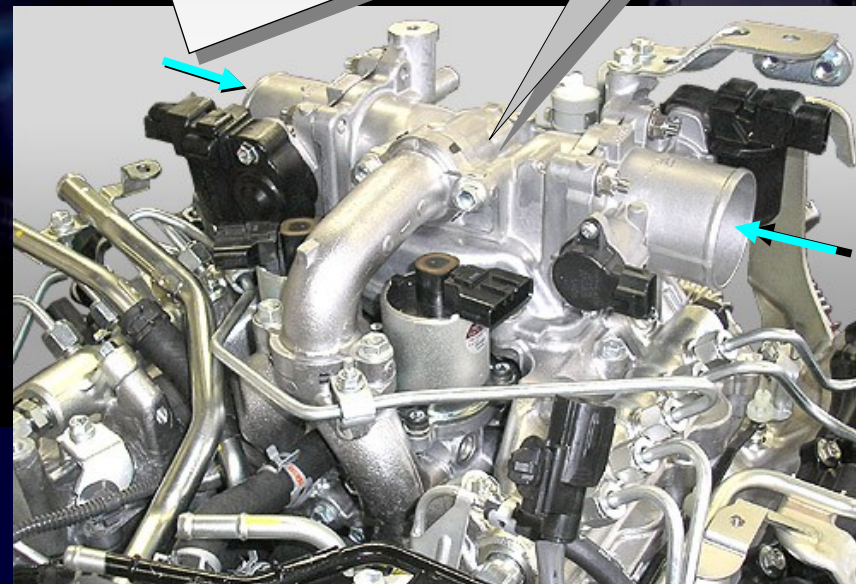
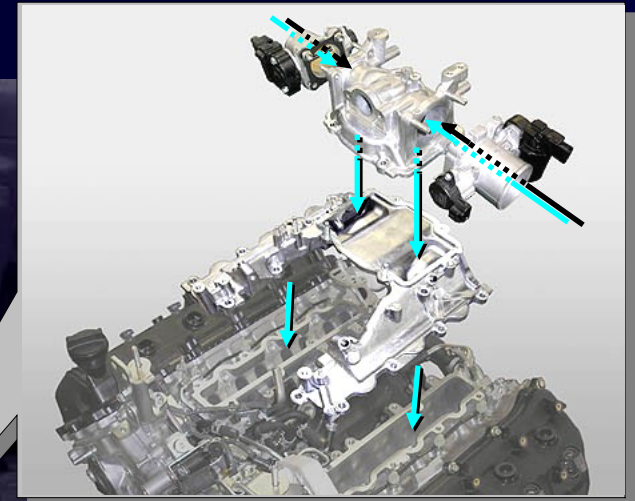
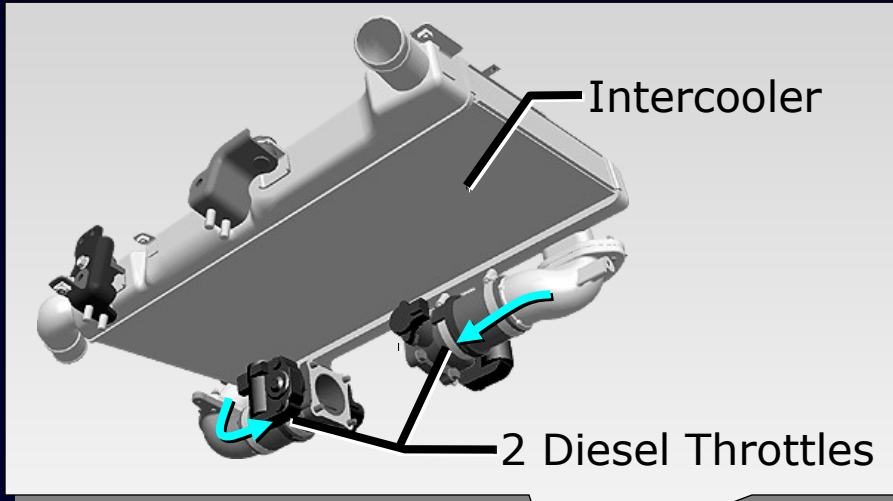
Turbo Motor Driver  
(For Bank2)



# Intake and Exhaust System

	-W	-Q	-V		-
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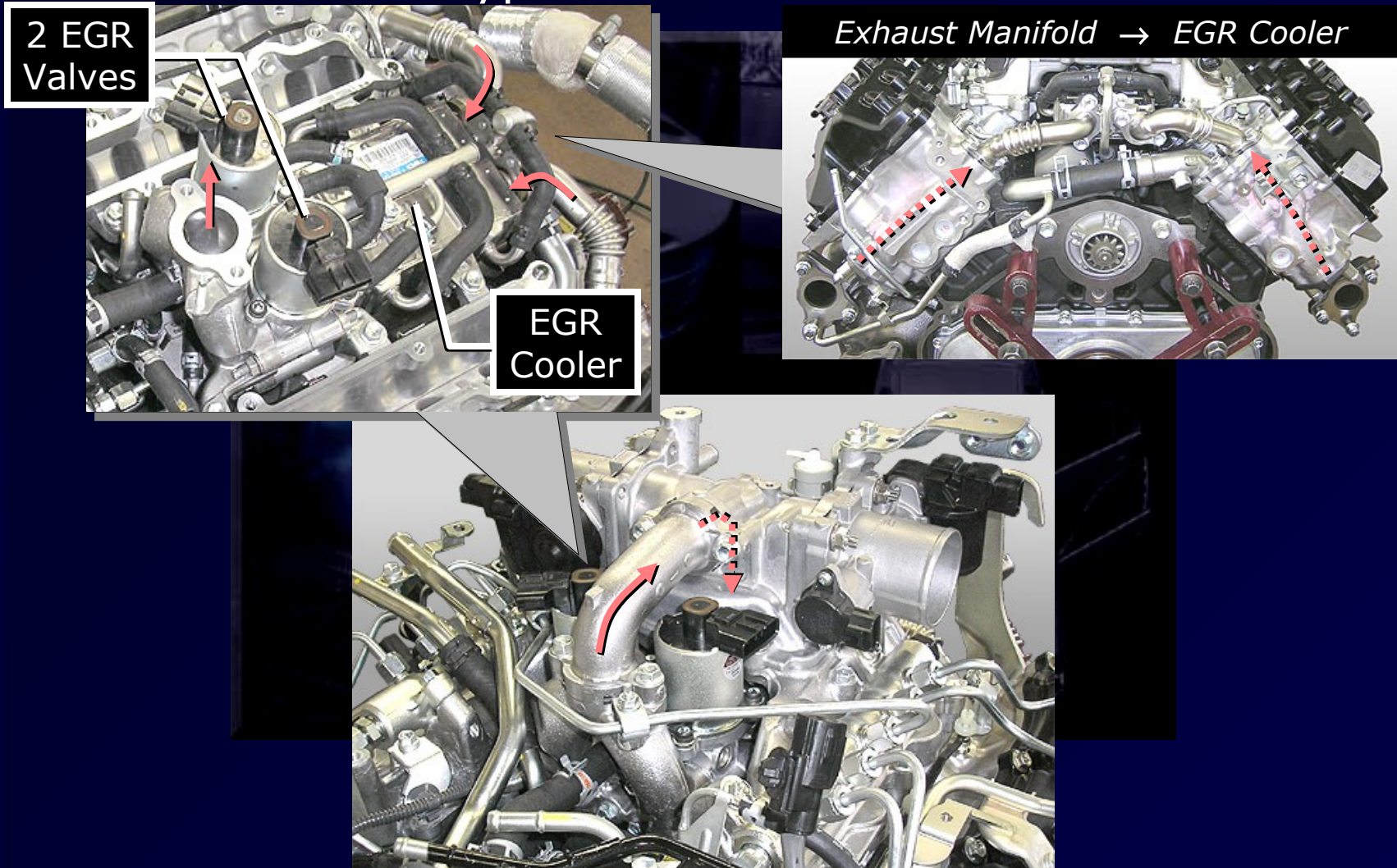
- Diesel Throttle
  - Rotary solenoid type 2 diesel throttles are used



# Intake and Exhaust System

	-W	-Q			-
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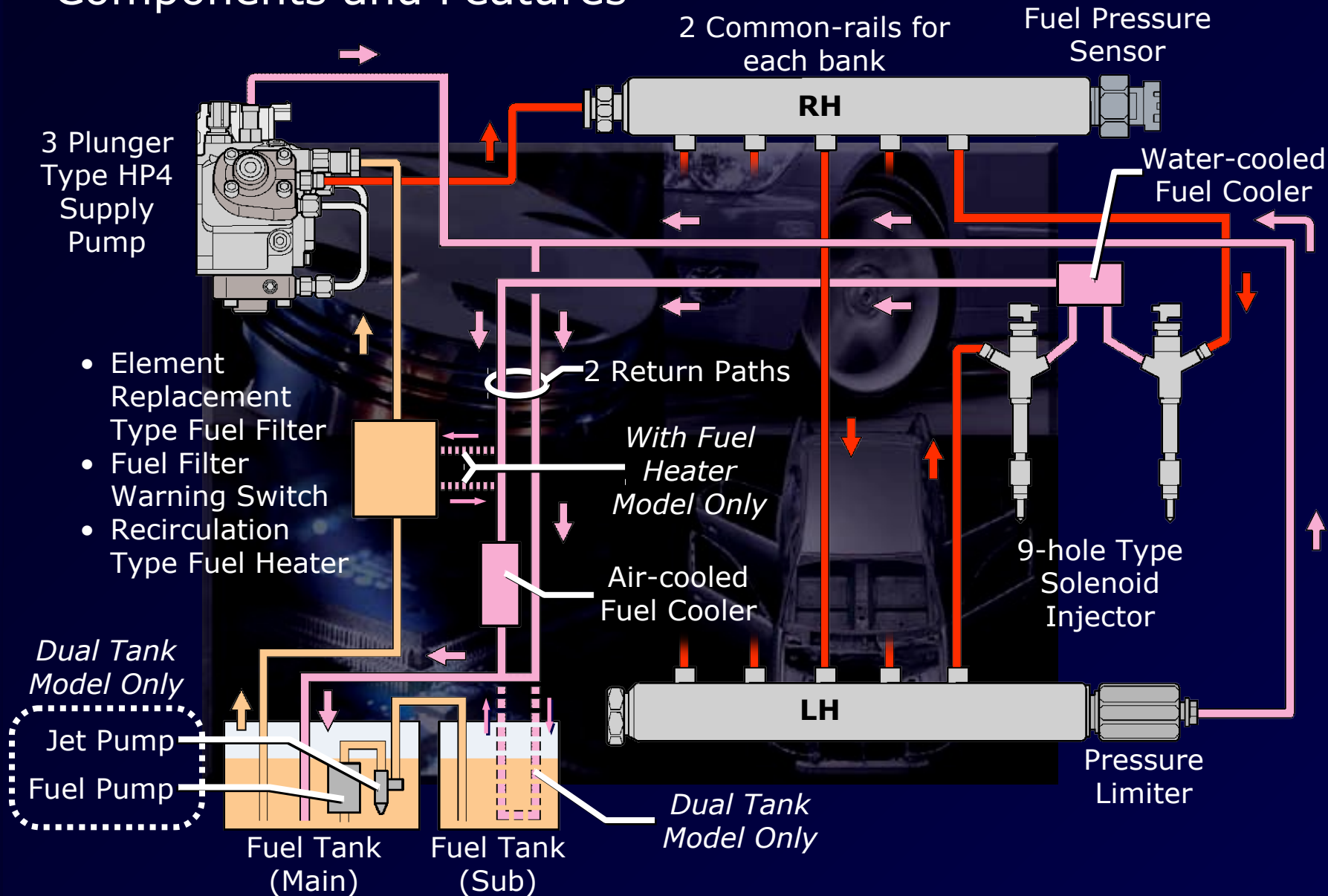
- EGR System
  - Liner solenoid type 2 EGR valves
  - Water-cooled type EGR cooler



# Fuel System

-W	-Q	-V	-
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## Components and Features



- Element Replacement Type Fuel Filter
- Fuel Filter Warning Switch
- Recirculation Type Fuel Heater

*Dual Tank Model Only*



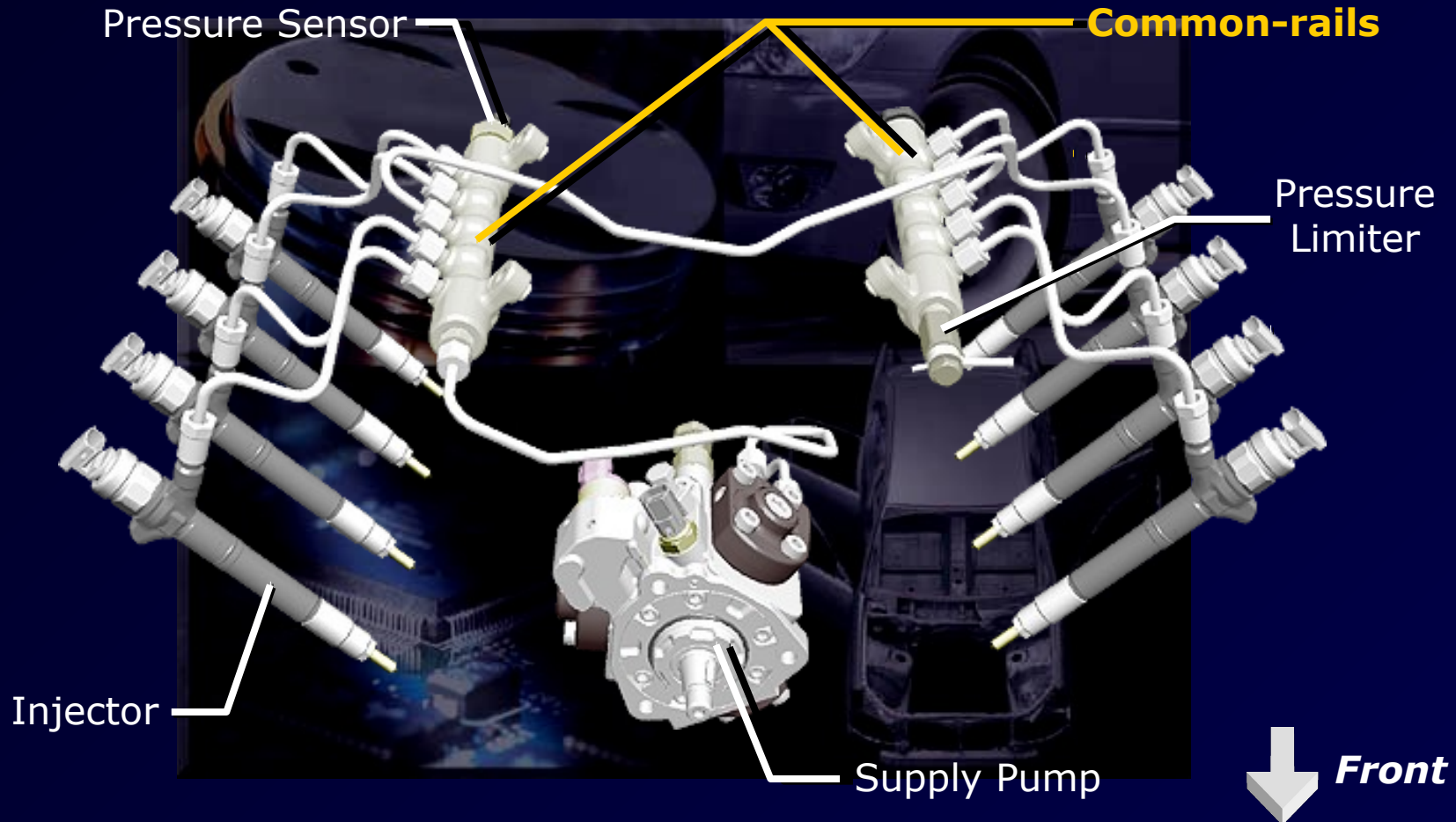
*Dual Tank Model Only*



# Fuel System

	-W	-Q	-V		-
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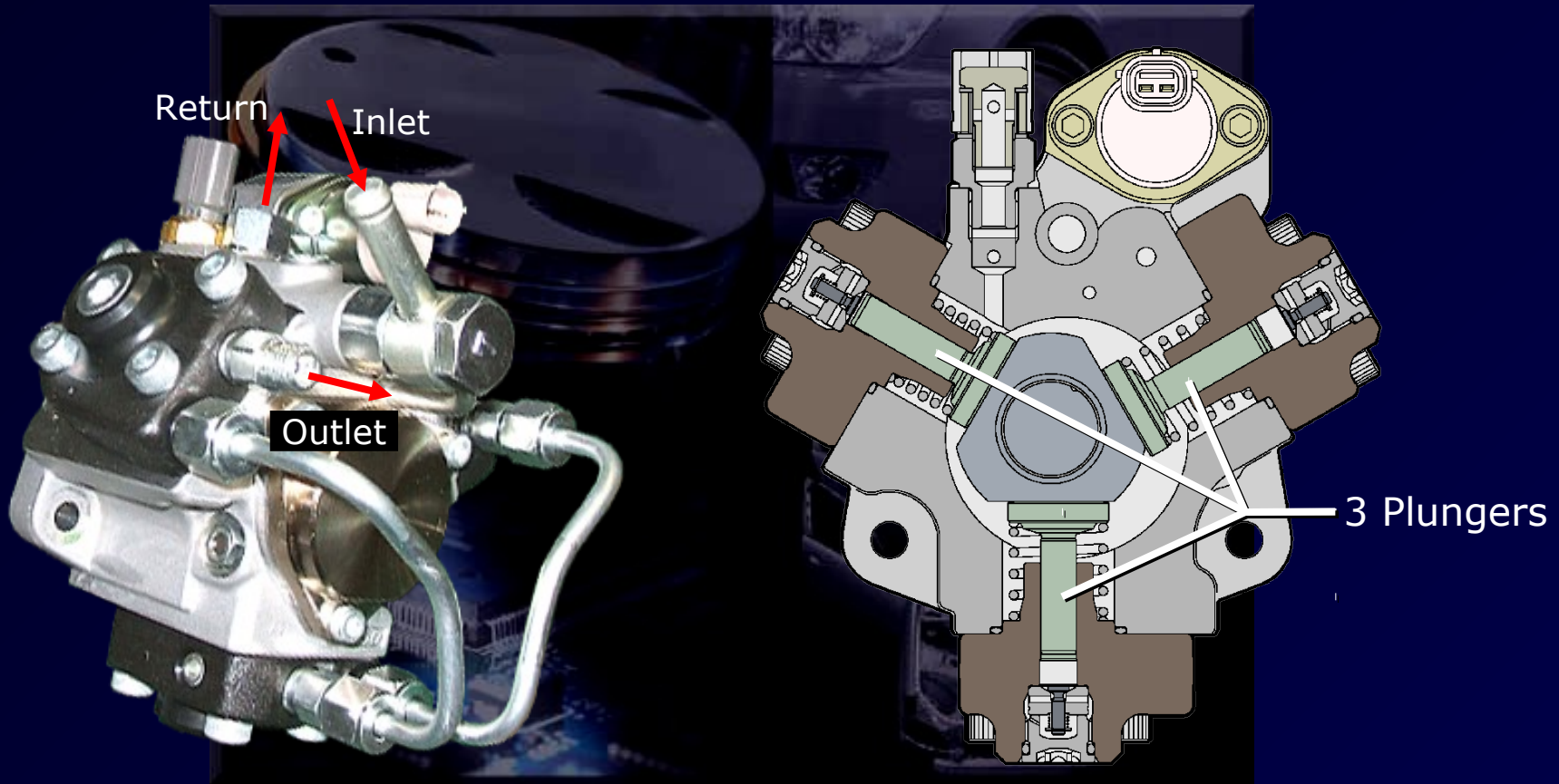
- Common-rail
  - 2 Common-rails for each bank



## Fuel System

	-W	-Q	-V		-
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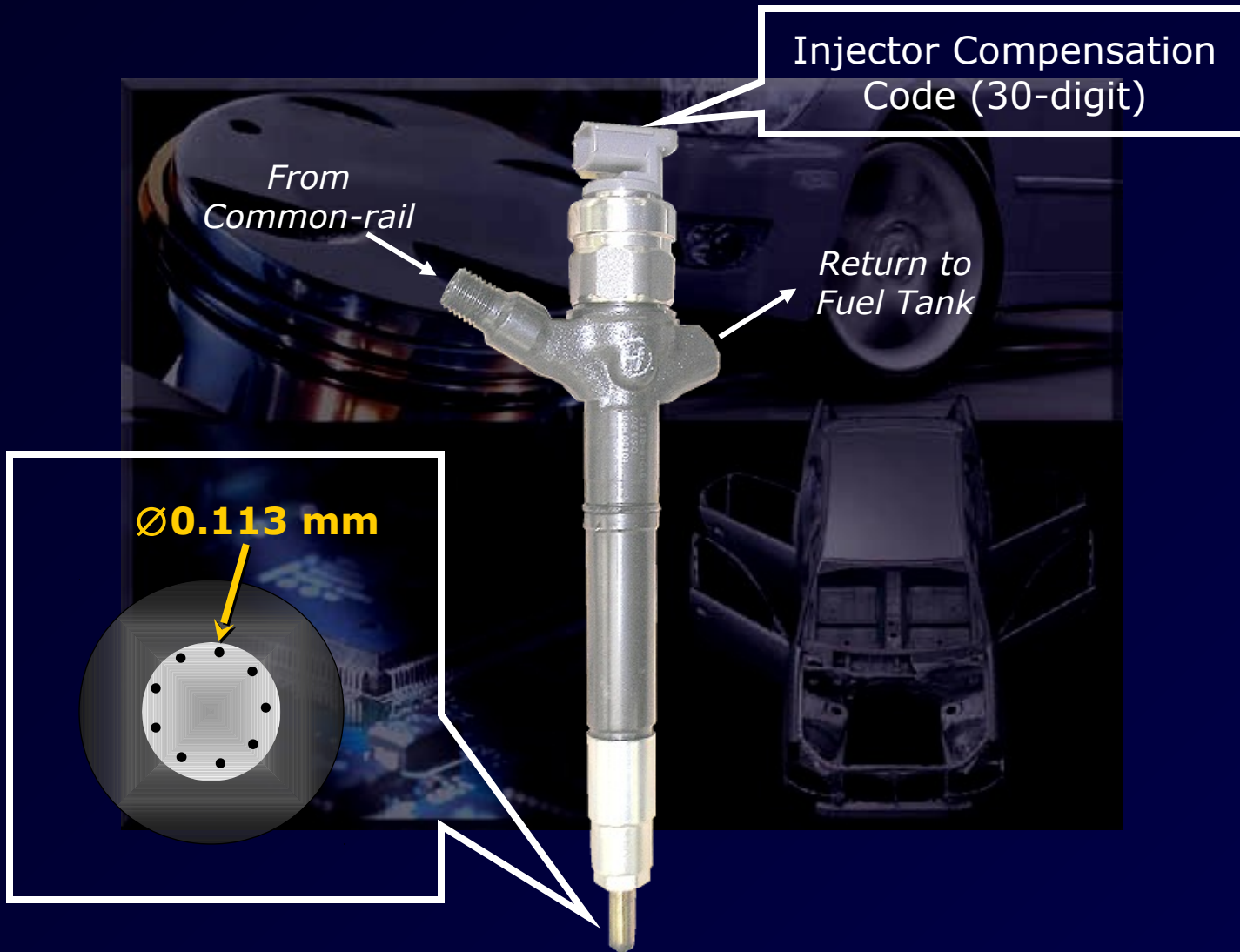
- Supply Pump (HP4)
  - 3 plunger type supply pump is used to correspond to the injection volume increase



# Fuel System

	-W	-Q	-V		-
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- Injector
  - 9-hole type solenoid injector is used



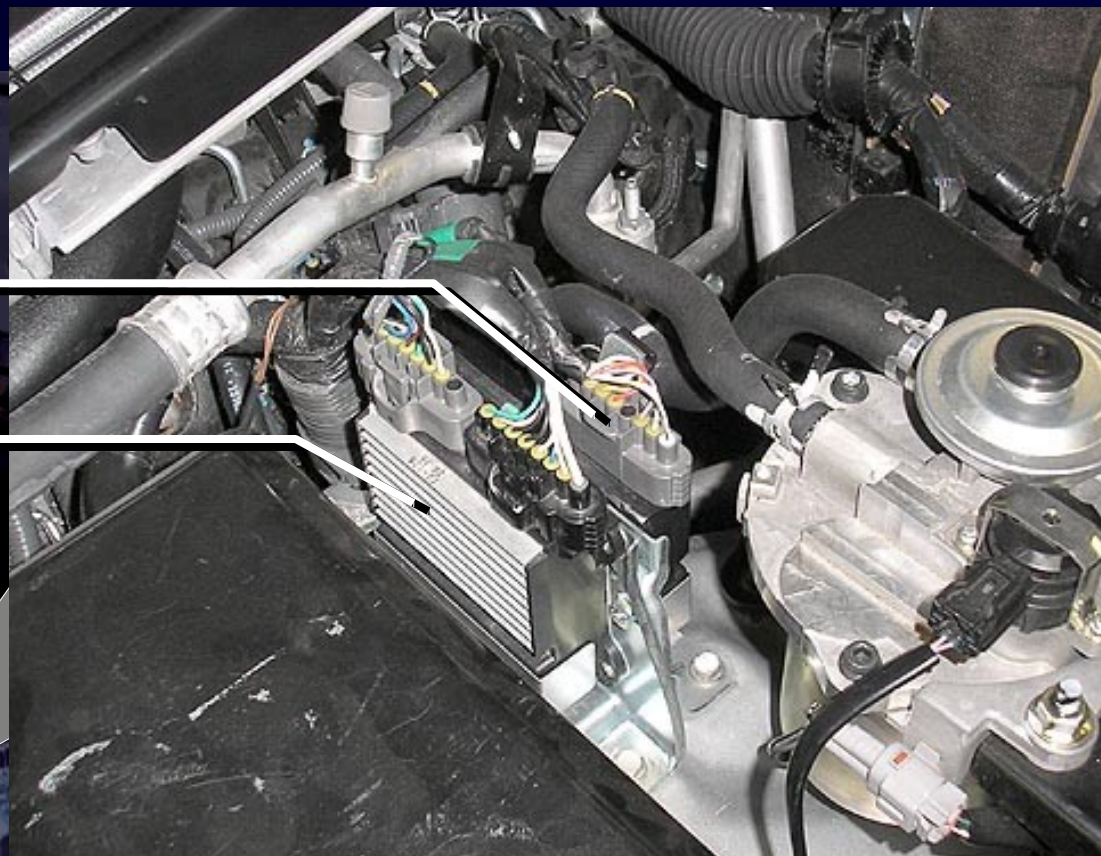
# Fuel System

	-W	-Q	-V		-
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- EDU
  - 2 EDUs are used

EDU for  
#1,4,6,7

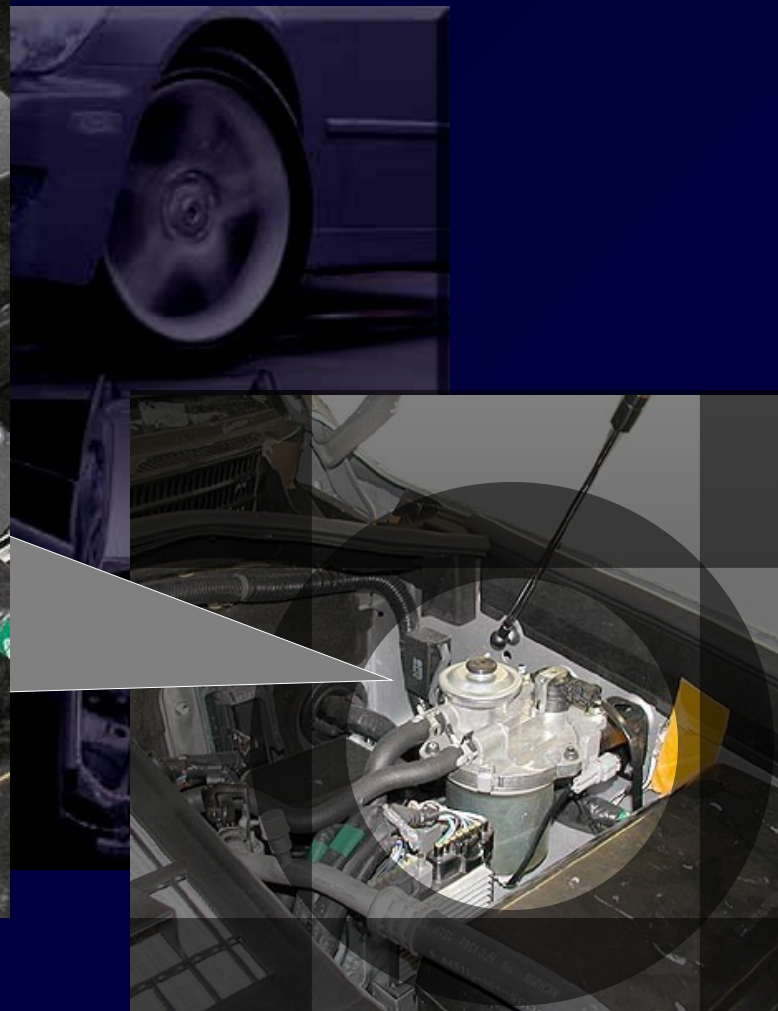
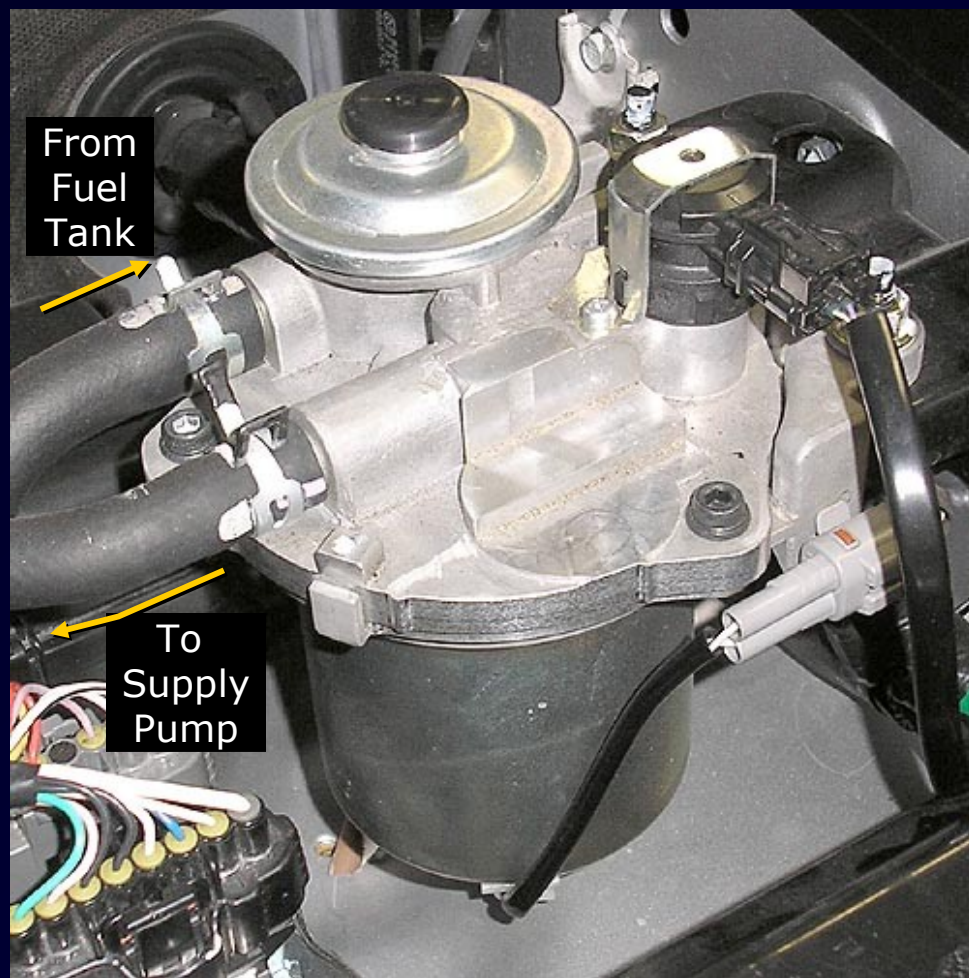
EDU for  
#2,3,5,8



# Fuel System

	-W	-Q	-V		-
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- Fuel Filter
  - Element replacement type fuel filter is used



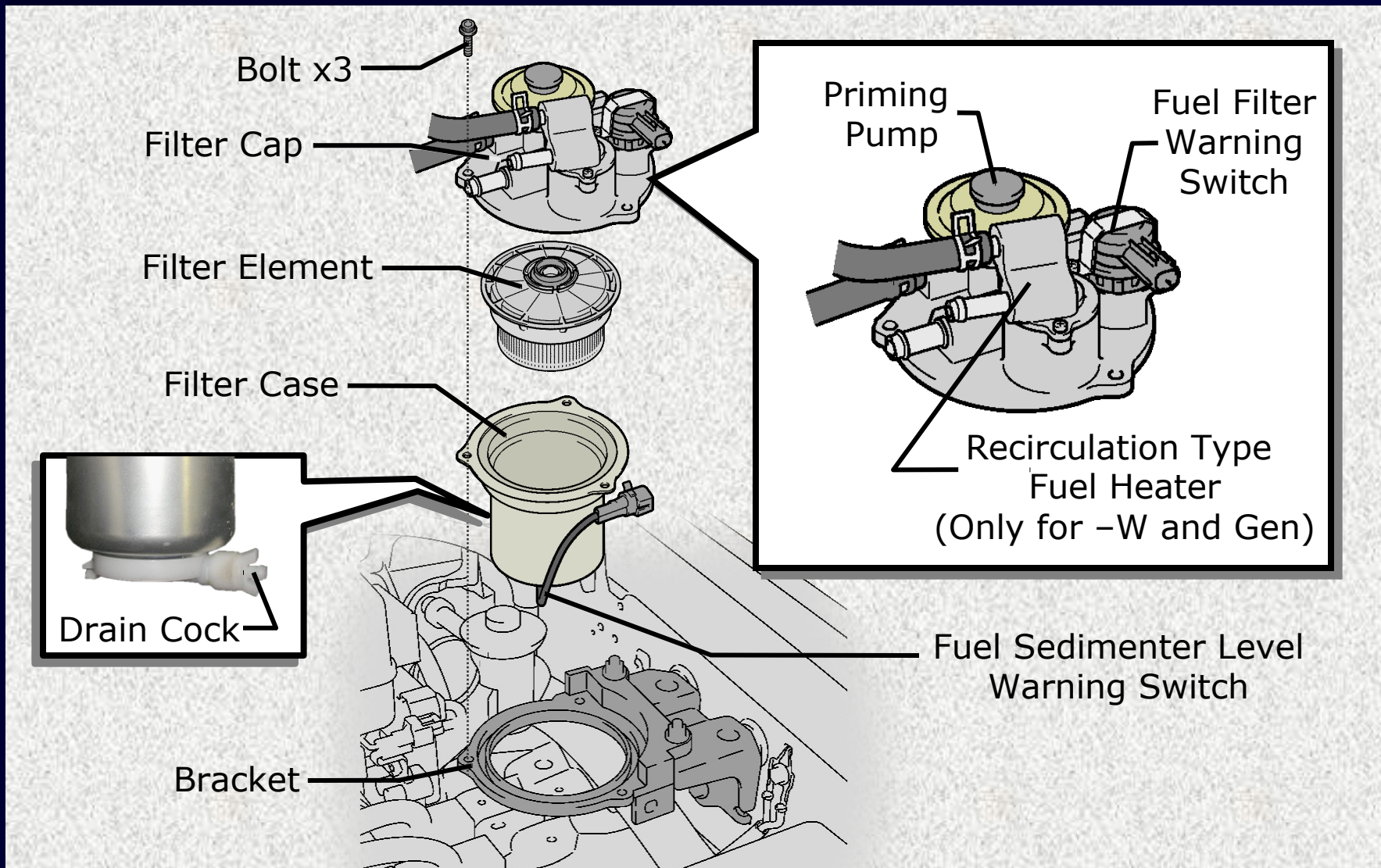
Fuel Filter



# Fuel System

-W	-Q	-V		-
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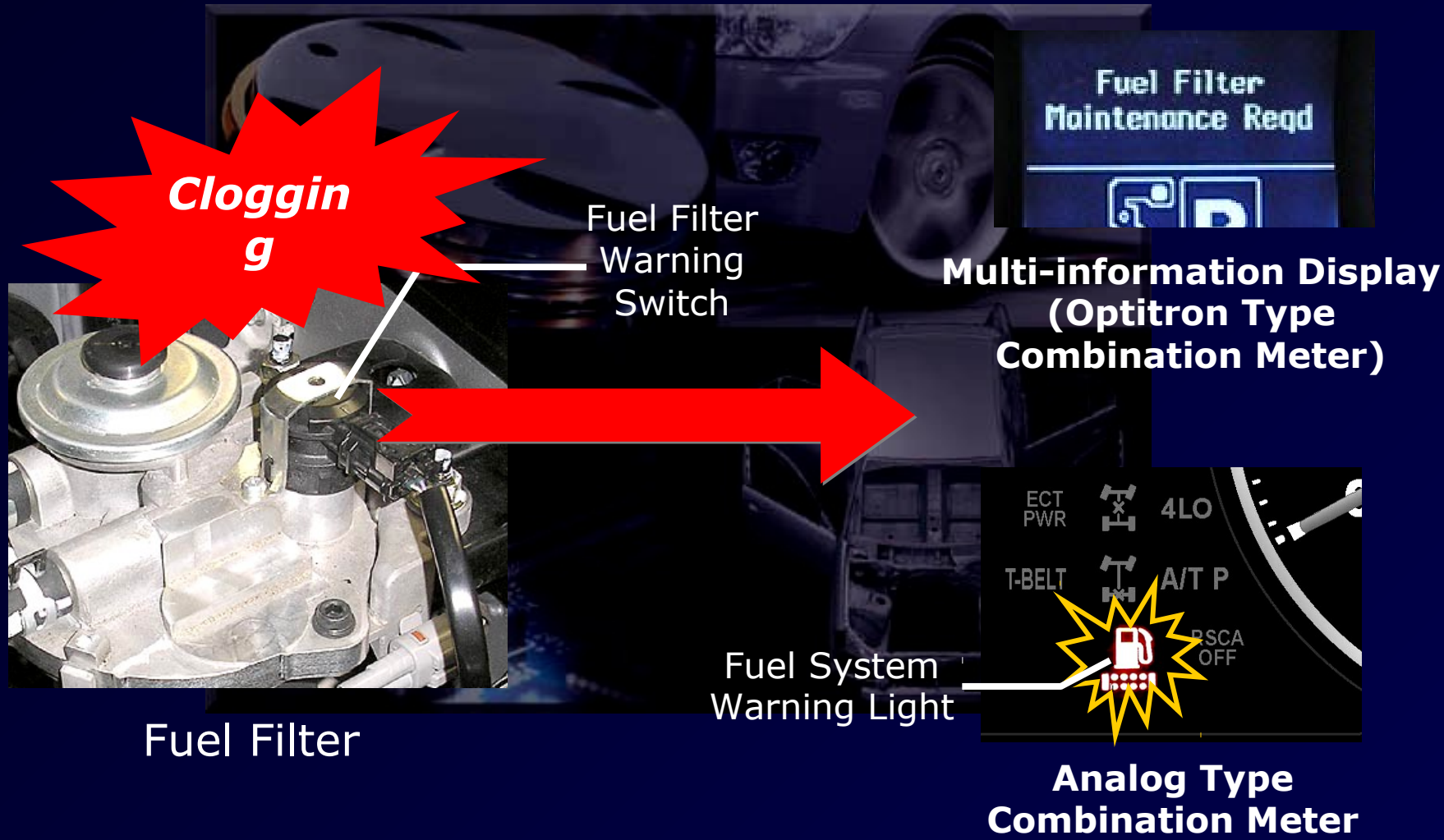
- Fuel Filter
- Main Components



# Fuel System

	-W	-Q	-V		-
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- Fuel Filter
  - When the fuel filter clogging is detected by fuel filter warning switch, fuel filter replacement is required

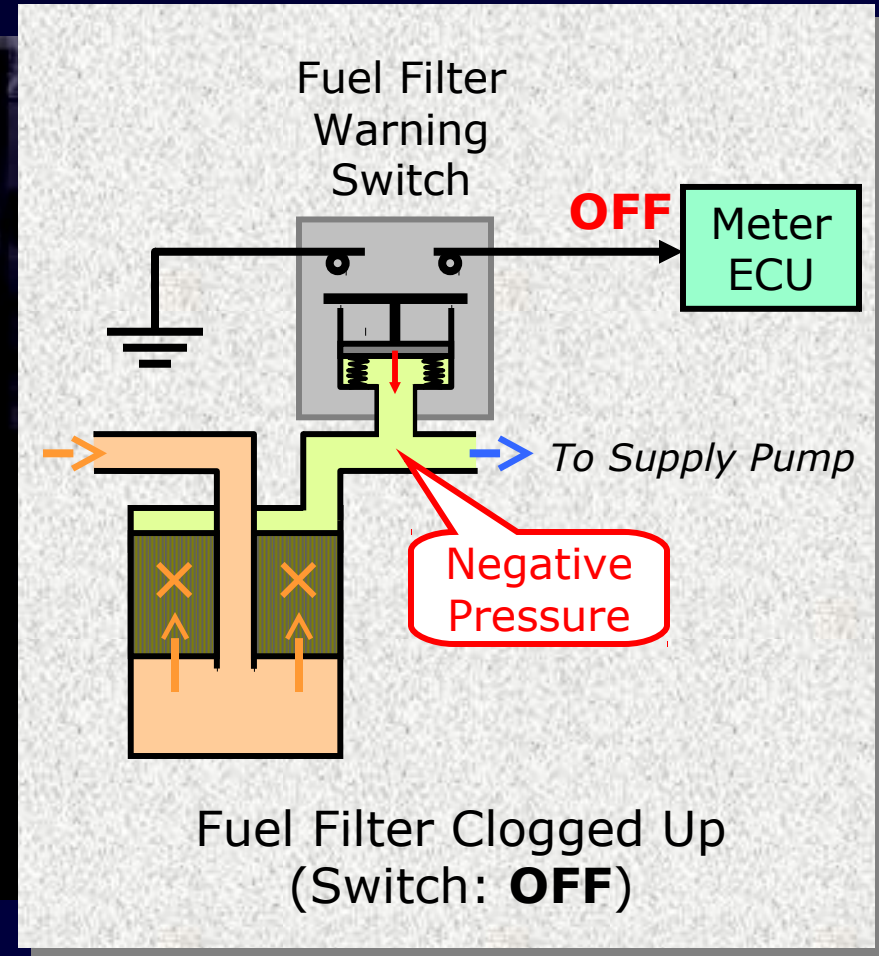
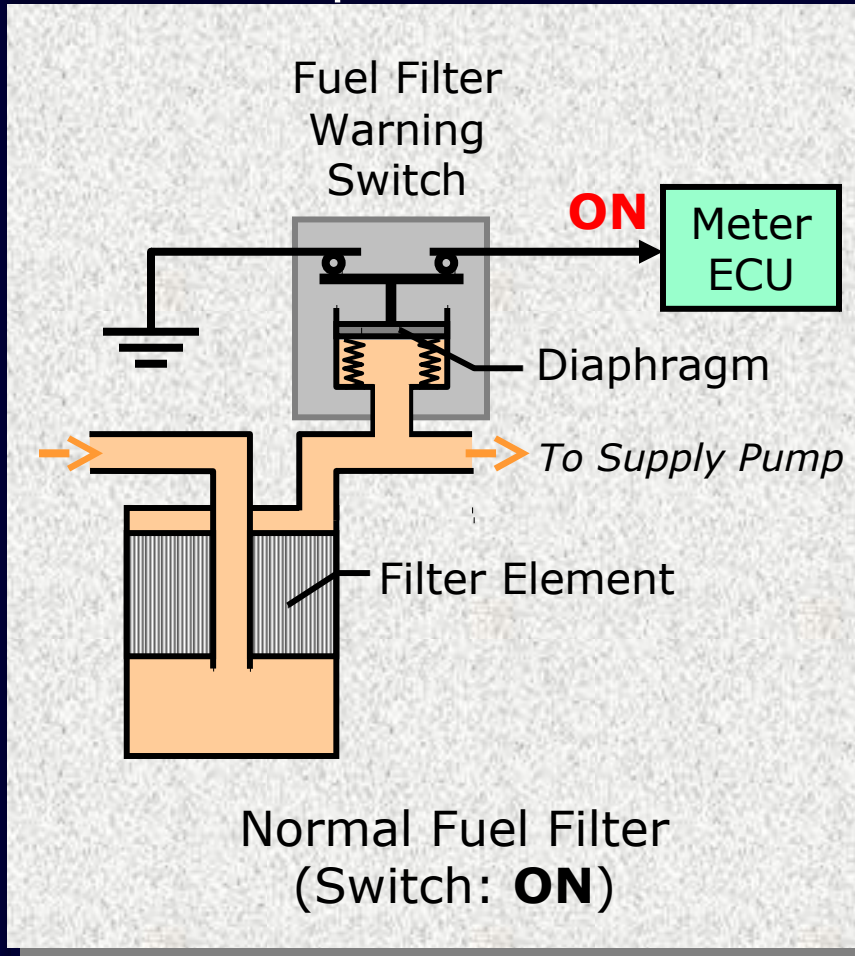


# Fuel System

	-W	-Q	-V		-
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## Fuel Filter

- Fuel filter warning switch is turned OFF when the filter outlet pressure decreases







# Fuel System



- Fuel Filter (Analog Type Combination Meter Only)
  - Warning light condition for fuel filter / fuel sedimenter

Warning	Warning Method	Priority
Sedimenter Warning	 Blink	1
Fuel Filter Warning	 ON	2



**Analog Type Combination Meter**

# Fuel System

	-W	-Q	-V		-
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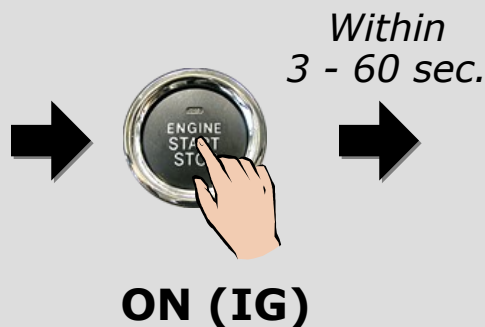
- Fuel Filter
  - After the fuel filter replacement, perform the reset operation to turn off the warning message/light

## Reset Operation



### Fuel Filter Replacement

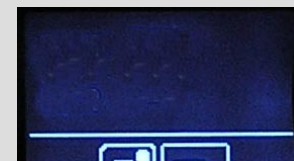
(fuel filter warning switch connector disconnected)



Within  
3 - 60 sec.



3 sec.



Warning message is turned OFF

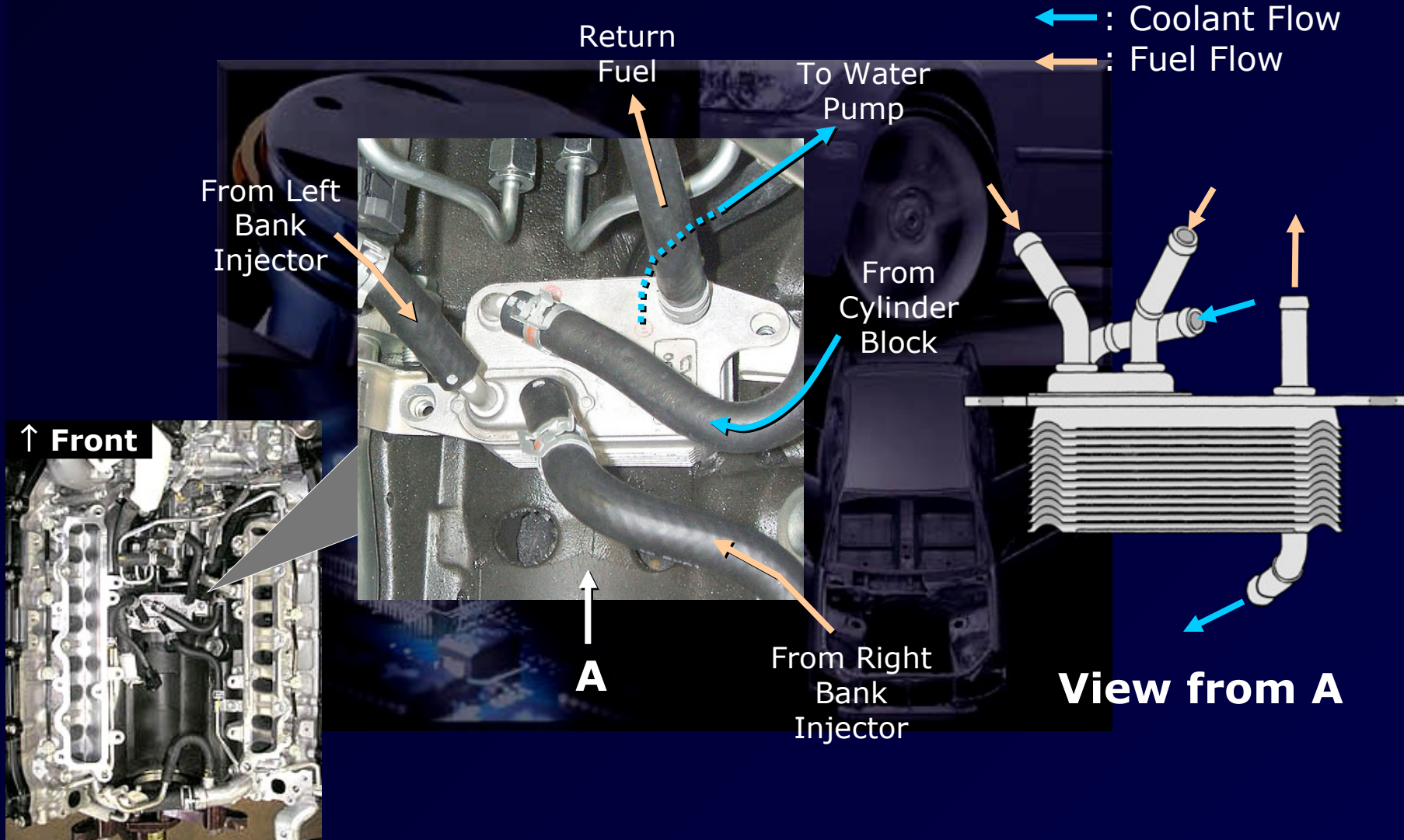


**Reset operation is same as 1KD/2KD engine on HIACE and IMV**

# Fuel System

	-W	-Q	-V		-
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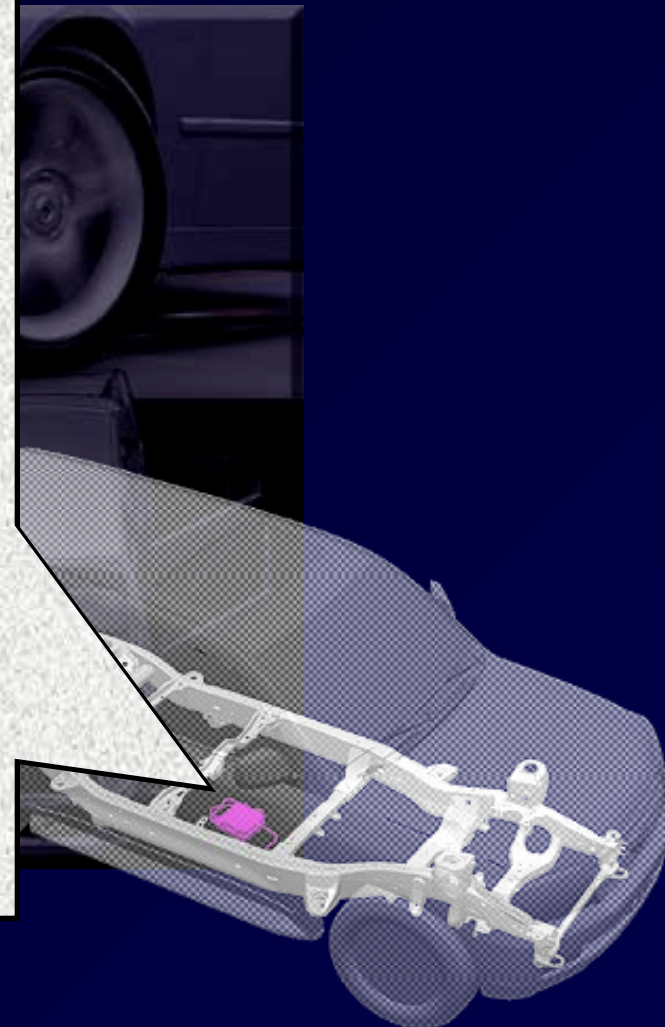
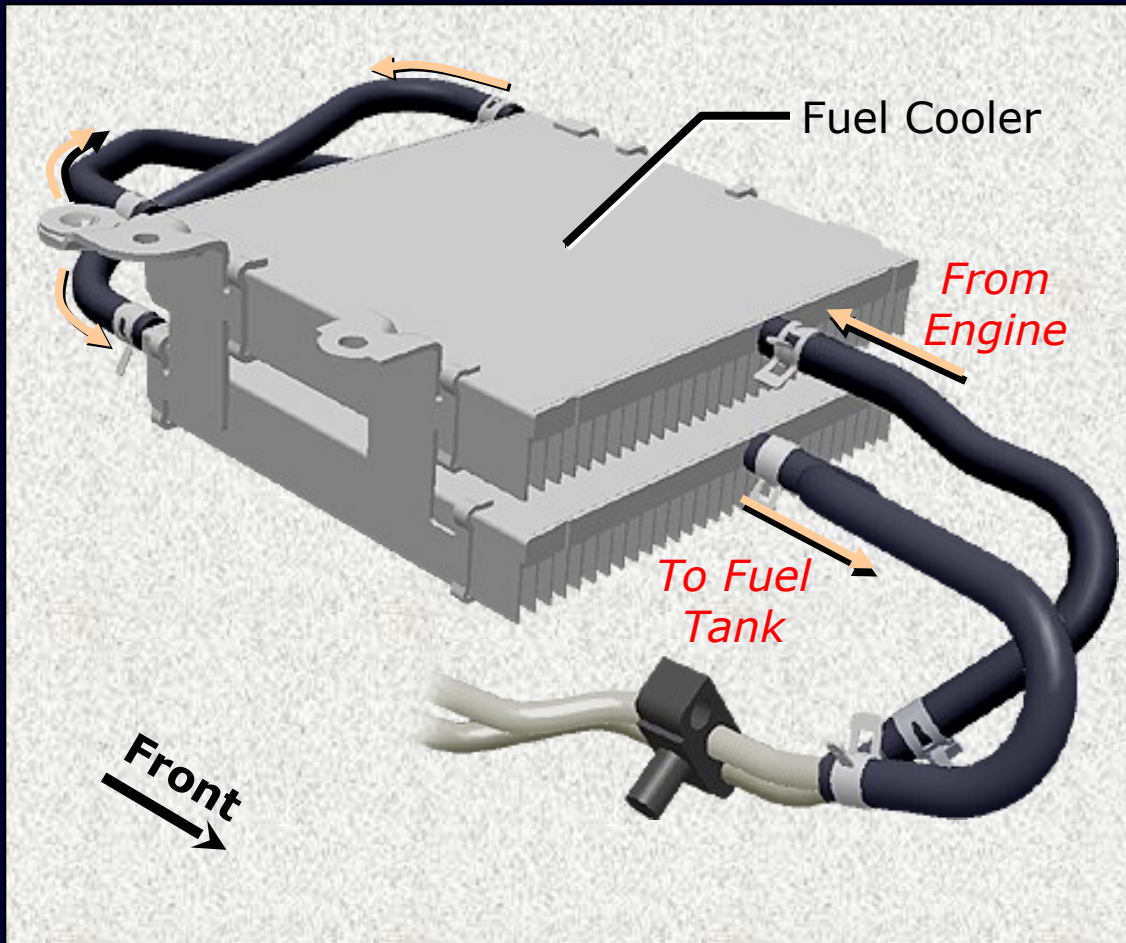
- Fuel Cooler
  - Water-cooled type fuel cooler at the V bank



# Fuel System

	-W	-Q	-V		-
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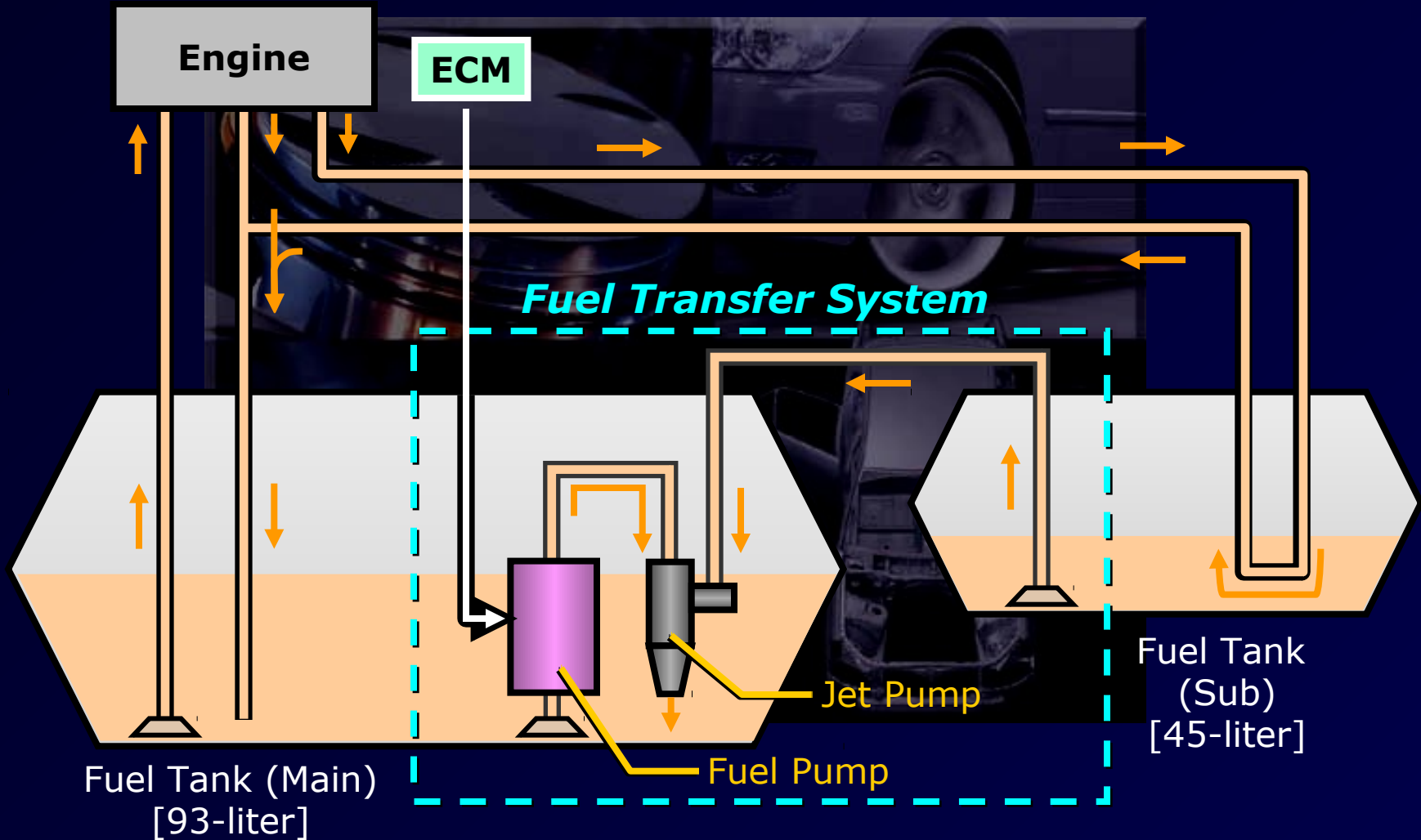
- Fuel Cooler
  - Air-cooled type fuel cooler under the floor



# Fuel System

		-Q	-V		-
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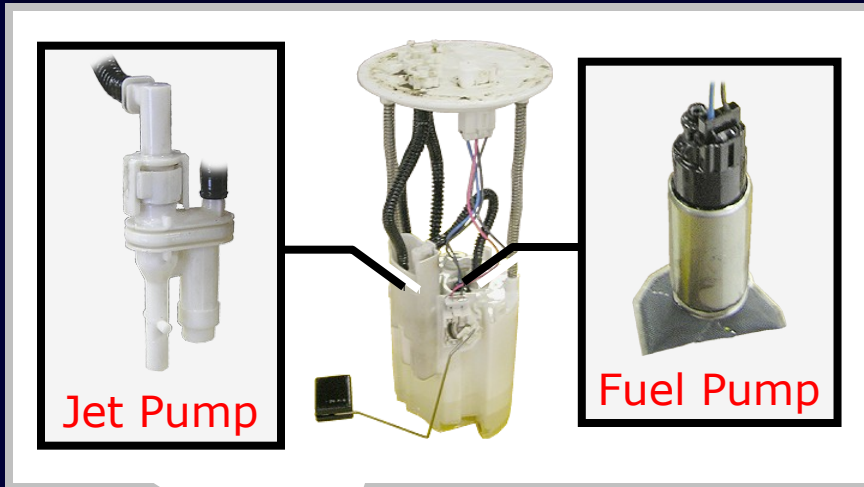
- Fuel Pump (Dual Fuel Tank Model Only)
  - Fuel pump is provided in the main tank to transfer the fuel in sub tank to main tank



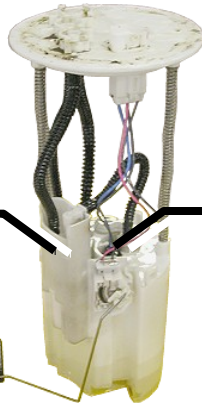
# Fuel System

		-Q	-V		-
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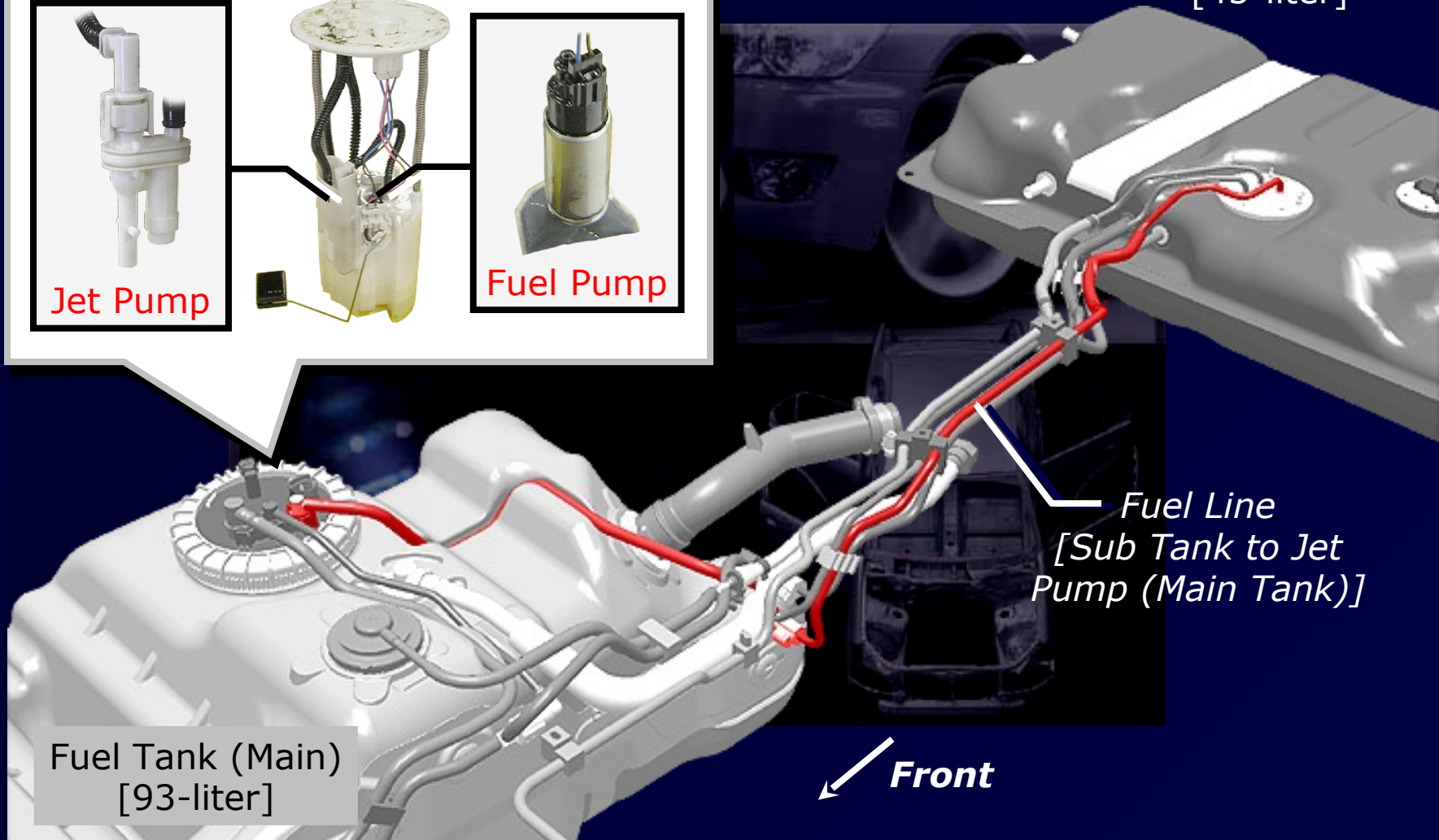
- Fuel Pump (Dual Fuel Tank Model Only)
  - Location



Jet Pump



Fuel Pump



Fuel Tank (Sub)  
[45-liter]

Fuel Line  
[Sub Tank to Jet  
Pump (Main Tank)]

Fuel Tank (Main)  
[93-liter]

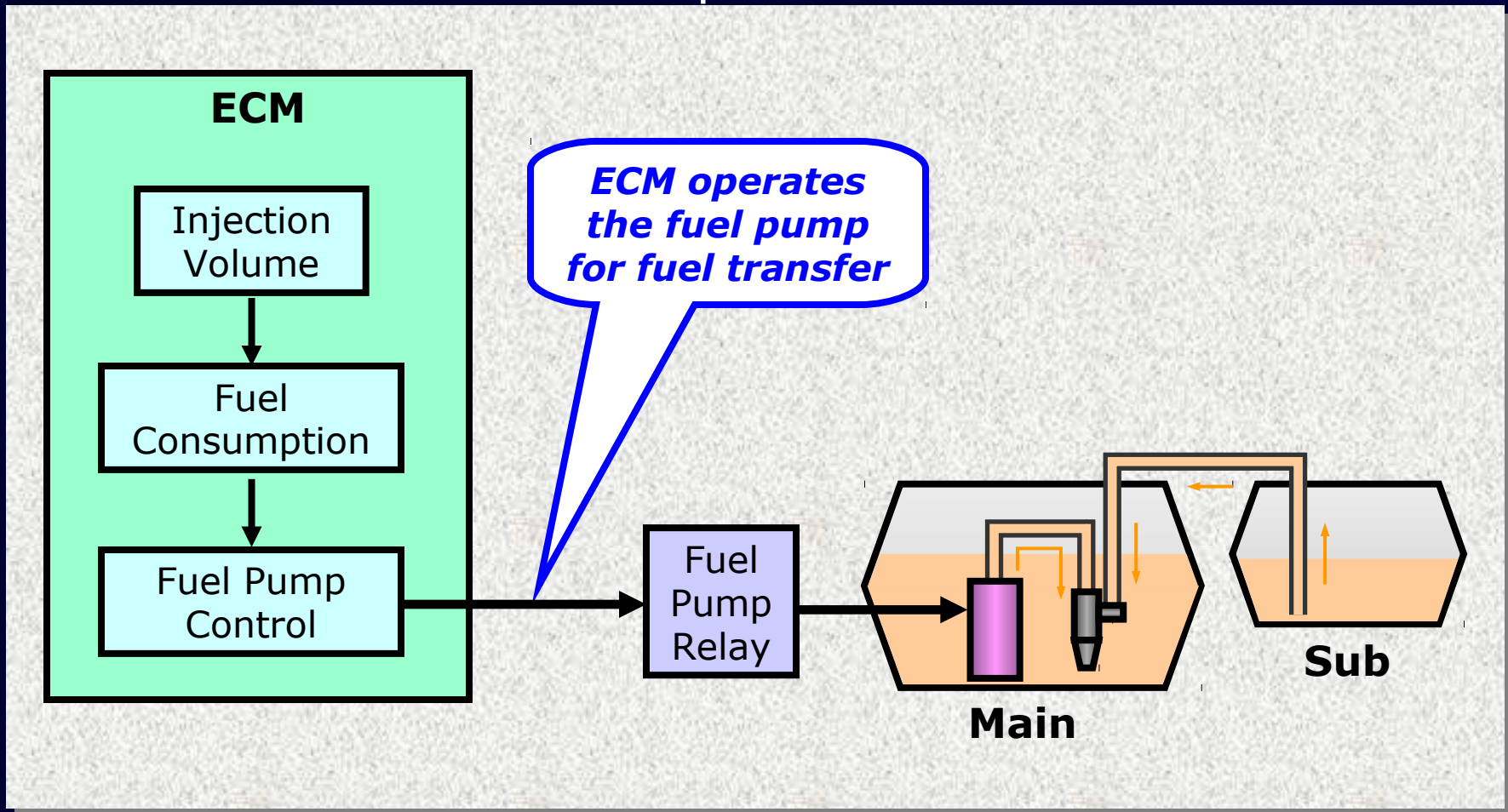
Front



# Fuel System

		-Q	-V		-
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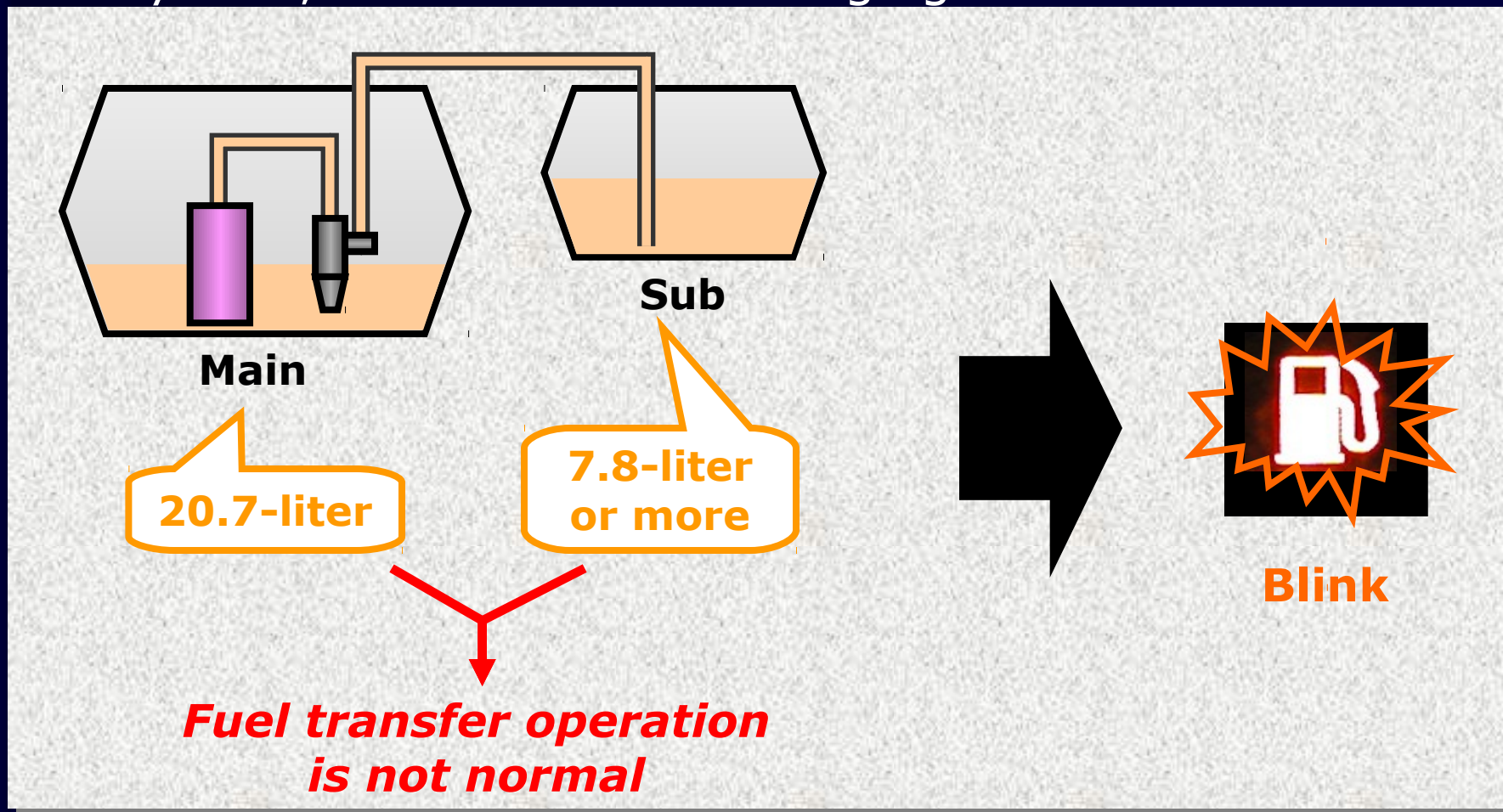
- Fuel Pump (Dual Fuel Tank Model Only)
  - ECM controls a fuel pump in accordance with the amount of fuel consumption



## Fuel System

		-Q	-V		-
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- Fuel Pump (Dual Fuel Tank Model Only)
  - When the malfunction is detected in the fuel transfer system, the fuel level warning light is blinked





# Engine Mount

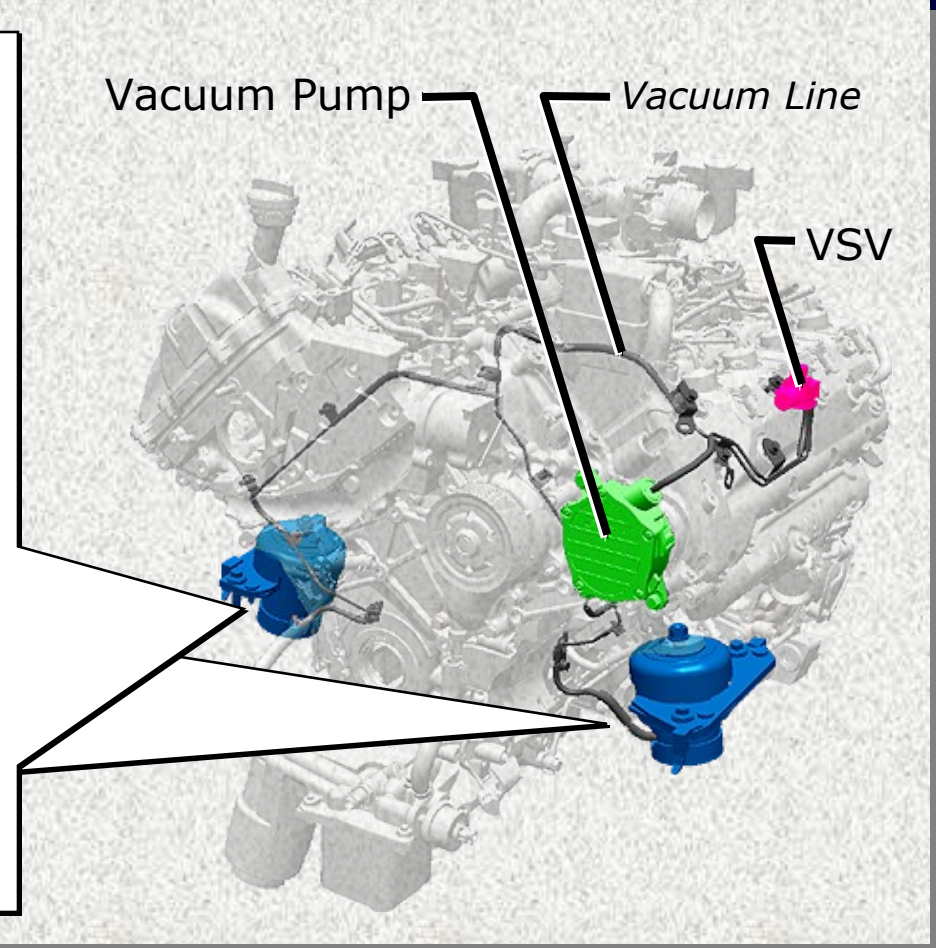
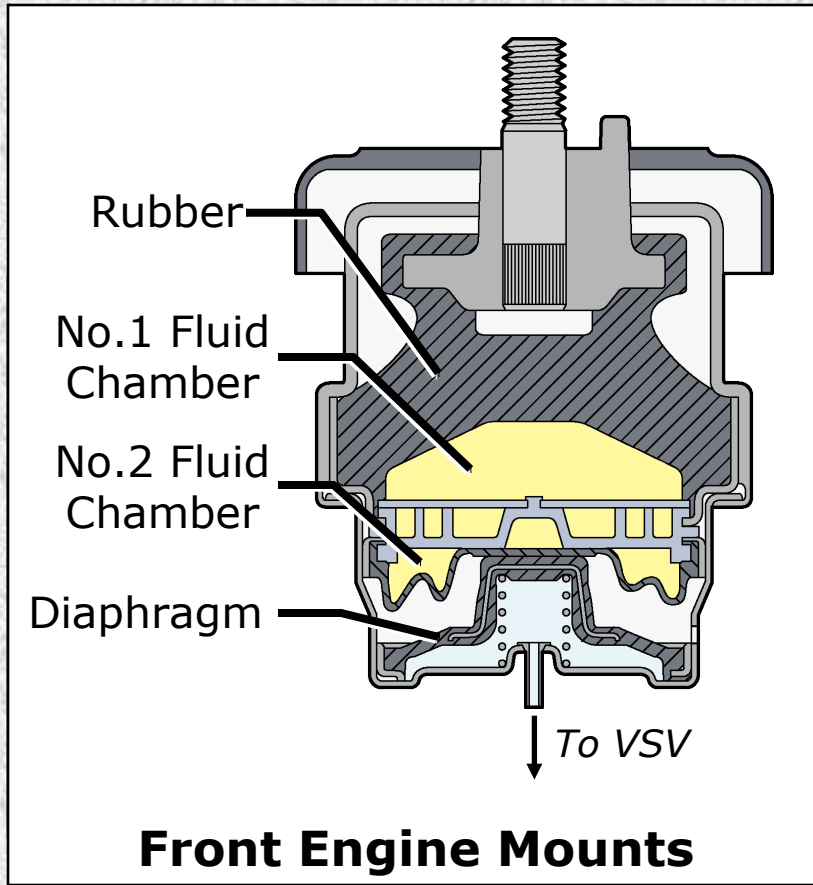
-W

-Q

-V

-\_

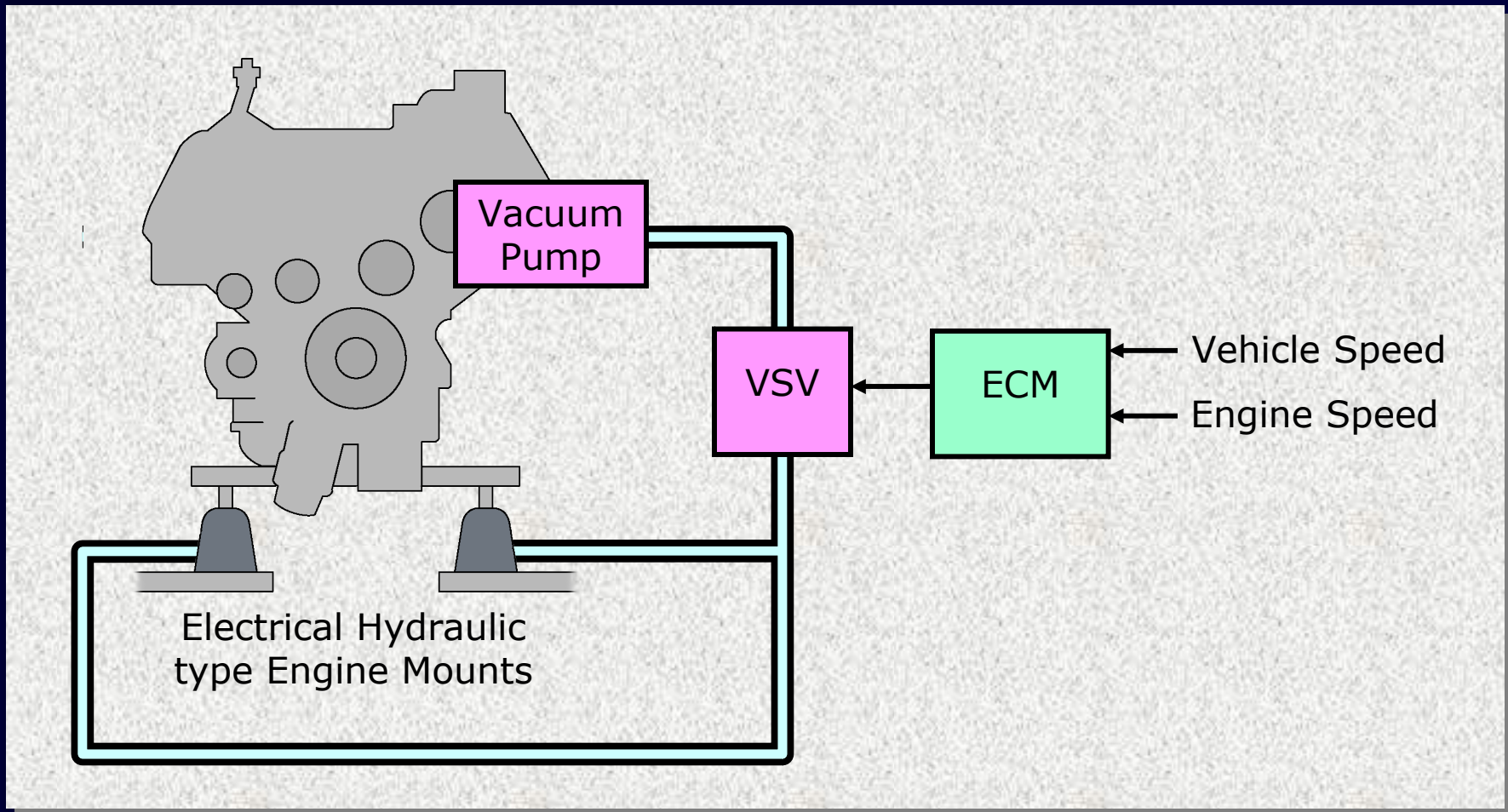
- Electrical Hydraulic Type Engine Mount
  - The electrical hydraulic type is used for the front engine mounts to reduce the engine vibration at idling



# Engine Mount

	-W	-Q	-V		-
--	----	----	----	--	---

- Electrical Hydraulic Type Engine Mount – System Diagram



# Engine Mount

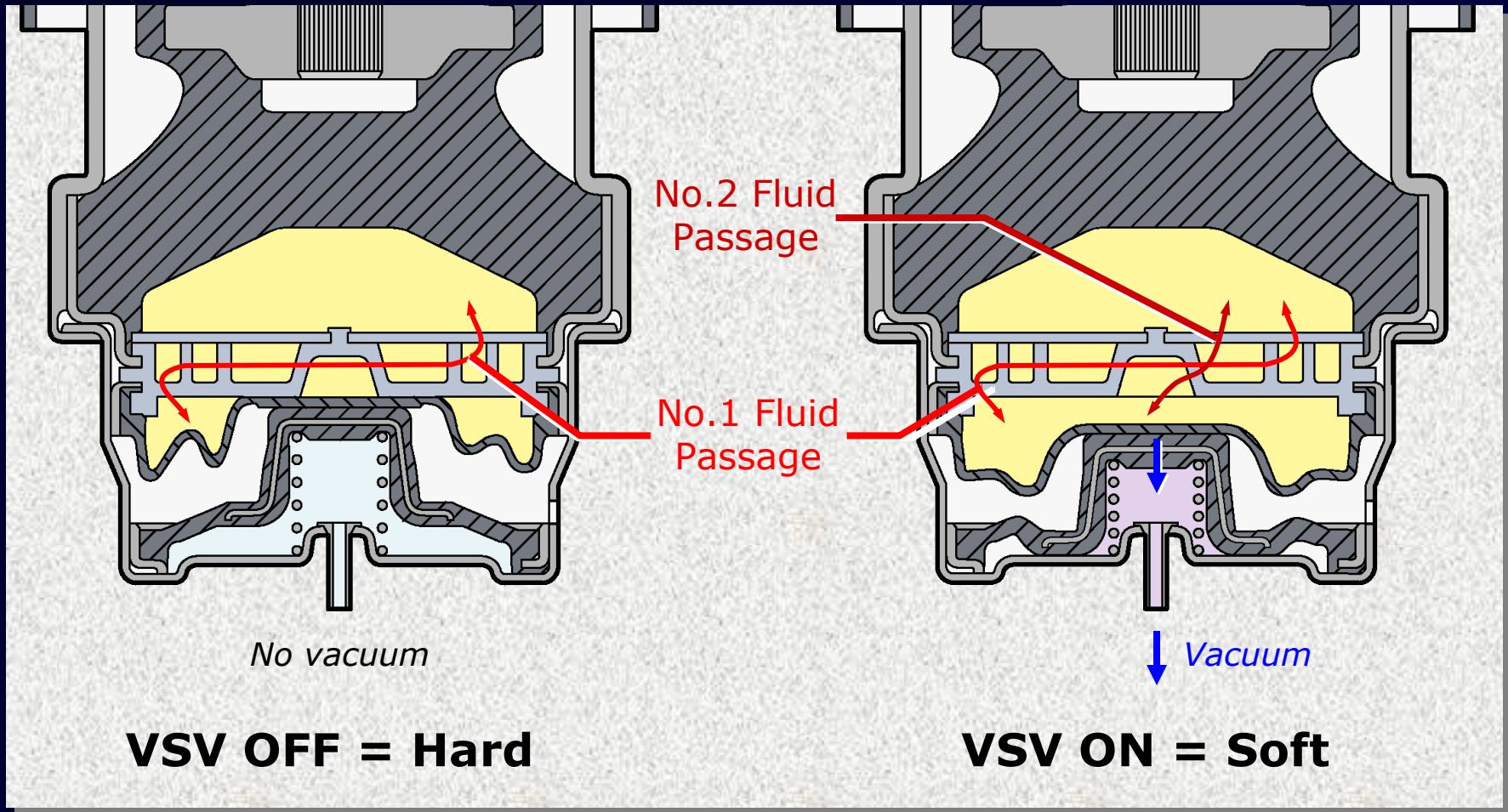
-W

-Q

-V

-\_

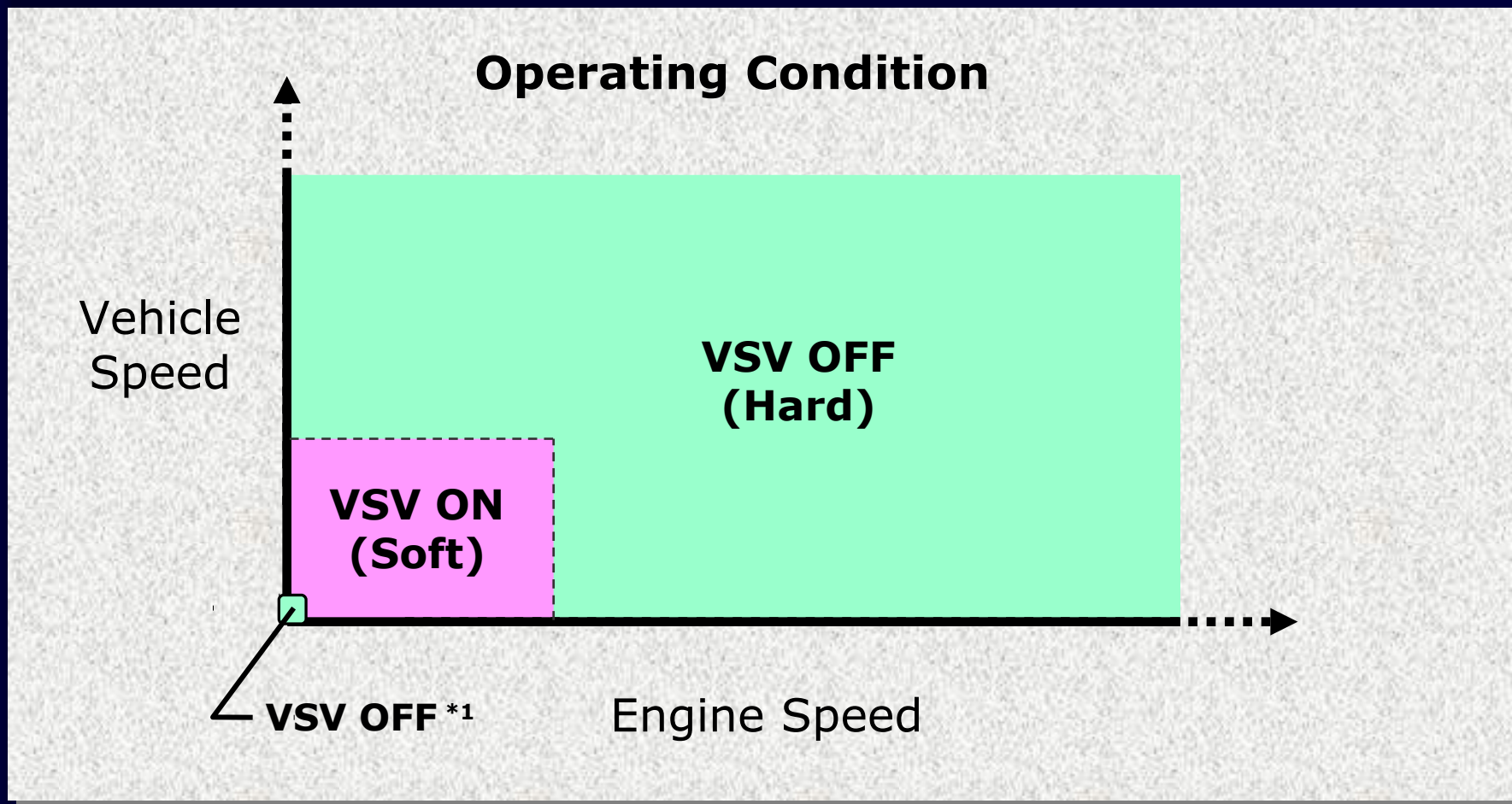
- Electrical Hydraulic Type Engine Mount – Mount characteristic



## Engine Mount

	-W	-Q	-V		-
--	----	----	----	--	---

- Electrical Hydraulic Type Engine Mount
  - When the engine is idling and vehicle is driving at a low speed, the VSV is turned ON



\*1: During engine cranking (vacuum is unstable)

# Engine Control System

	-W	-Q	-V		-
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- ECM
  - Dash panel penetration installation

